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Editor

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Foreword

This volume brings together the results of analysis and policy research undertaken within, on behalf of, or in collaboration with Foreign Affairs and International Trade Canada over the past year. Launched in 2001 as part of the response to the Government of Canada's *Policy Research Initiative*, a government-wide effort to re-create and expand its research capacity, the *Trade Policy Research* series is now in its sixth edition.

Previous volumes have traced the debate in trade policy circles since the watershed developments at the 1999 WTO Ministerial in Seattle, following the progress of the Doha Round, touching on topical issues, including the surge in regional trade agreements, and showcasing research and analysis conducted within the Government of Canada on various aspects of trade policy and economic globalization more generally.

This year's volume continues in that vein. Part I provides a report on a roundtable discussion by international trade experts on the prospects for the Doha Round, taking into account the geopolitical and international macroeconomic context, as well as looming developments on the political calendar.

Part II compiles the papers presented at the conference *Integrative Trade between Canada and the United States—Policy Implications*, organized by Carleton University's Centre for Trade Policy and Law, Ottawa, December 6, 2006. The papers in this part examine the implications of the re-shaping of international commerce through the on-going fragmentation of the production process for our conceptual understanding of trade and investment; the issues posed for statistical agencies in grappling with the changing international industrial landscape; and the implications of these developments for the trade policy community.

Part III includes two papers addressing regional trade issues: an assessment of the impact of trade with Canada on US state-level jobs and output, updating and expanding an earlier study on this theme included in *Trade Policy Research 2004*;

and an assessment of the impact of free trade agreements on Canada's automotive sector.

Through this volume, Foreign Affairs and International Trade Canada seeks to continue to contribute actively to the discussion concerning the role of international trade and investment in Canada's economy and in the global economy more generally, to continue to work in the spirit of the broader commitment of the Government of Canada to stimulate the development of its applied research capacity, and to further develop links with professional and academic researchers in the field of international commerce.

This volume was produced under the guidance of Anthony F. Burger, Chief Economist, Foreign Affairs and International Trade Canada.

The Editor
Ottawa
March, 2007

Part I

Multilateral Trade Issues

A New Realism in the Doha Round? A Roundtable Discussion

John M. Curtis and Dan Ciuriak[*]

On March 2-3, 2006, a group of leading observers of the international trade and investment scene gathered in Ottawa for an informal discussion of the prospects for the Doha Development Agenda in view of the progress in negotiations made at the Sixth Ministerial Conference of the World Trade Organization (WTO) at Hong Kong, China, December 2005. The roundtable discussion was sponsored by the Centre for International Governance Innovation at the University of Waterloo and the International Development Research Centre, in coordination with the Department of Foreign Affairs and International Trade. The talks focused on the progress of negotiations and the prospects for an ambitious outcome, taking into account the geopolitical and international macroeconomic context, as well as looming developments on the political calendar. This note represents the Chair's thematic summary of the discussions. As these were held under Chatham House rules, no attribution is given. Responsibility for the interpretation of the discussion rests entirely with the authors. Although the prospects for a successful conclusion of the Round remain in doubt, the analysis is still relevant.

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[*] John M. Curtis was at the time Chief Economist and Dan Ciuriak Deputy Chief Economist, Foreign Affairs and International Trade Canada. The views expressed in this Chapter reflect the discussion at the roundtable and are not to be attributed to Foreign Affairs and International Trade Canada or to the Government of Canada, to the Centre for International Governance Innovation, University of Waterloo, or to the International Development Research Centre.

Introduction

With the benefit of now a half-decade's worth of perspective, it is clear that the Doha Development Agenda was pre-destined to delay and quite possibly to modest results.

Trade agreements have commercial objectives; but the Doha Round was launched in good measure as an international political response to 9/11. At the launch date of what became known as the Doha Development Agenda in November 2001, the commitments of the Uruguay Round had not been fully implemented, let alone absorbed. The technical groundwork for a new Round had not been laid; movement on the built-in agenda mandated in the agreement that concluded the Uruguay Round had been negligible. And the major looming challenges for world trade were to absorb the impact of the then imminent accession to the World Trade Organization (WTO) of China and the expiry of the textiles and clothing agreement.

Contextually, the Doha Round was launched at a point in time when the so-called Washington Consensus on economic policy was unraveling in the wake of a stunning series of emerging market crises that had begun with the Mexican financial crisis in 1994. Governance issues were literally exploding with anti-globalization protests at one international venue after another.

And two of the key issues in the Round were to be development and agriculture; as one indicator of the difficulties posed by these issues, the need to address them in the multilateral trade system was first noted in a report to Members of the General Agreement on Tariffs and Trade (GATT) back in 1958 by a panel of leading experts chaired by Gottfried Haberler. Four rounds have been completed since then; while some disciplines were adopted as part of the Uruguay Round outcome, agriculture and development remain major issues.

Complicating matters was the fact that some developing countries had come to feel that they had been, in the words of one observer at the Roundtable, "ambushed" in the Uruguay Round and were seeking a rebalancing of the results of that Round (which would of course not be in the interests of constituencies in the industrialized world such as the pharmaceuticals that had pushed for the Uruguay Round). Nor did it help that the first concrete steps on agriculture after Doha had been backward—the European Union's extension of the Common Agricultural Policy (CAP) in 2003 and the US Farm Bill of 2002 which expanded US agricultural support quite substantially.

Given the scale of the challenges, it is at least arguable that the Round progressed, all in all, rather well through its first four years—and indeed not out of line with what in retrospect would have been reasonable expectations. Consistent with this expressed optimistic view, the hard slogging in Geneva and various Ministerial meetings (plenary and mini) might well have served to bring expectations into line with a feasible outcome, finally allowing the Round to enter what one observer termed an "Age of Realism" in which the final moves toward agreement might be quickly and decisively taken.

Or not. Contemporary assessment of major events is hampered by the stubborn indeterminacy of the future—which in small part at least reflects the fact that contemporary assessment is itself part of the analytical feedback that plays into ultimate outcomes.

The following is a synthesis of the thoughts and views of close observers of the trade scene as regards the state of the multilateral trade negotiations and more generally of the global trade scene, as they were put forward and discussed in Ottawa shortly following the Sixth Ministerial Conference of the World Trade Organization (WTO) at Hong Kong, China, December 2005.

Is the Round still "doable"?

At the roundtable, it was argued that the outcome of the Doha Round negotiation turns on several inter-related questions:

- whether there is a persuasive commercial case for the round;
- whether a deal can be configured that meets the commercial objectives, with a reasonable balance of negotiating gains and concessions for all Members, and that is at the same time politically feasible; and

- whether such a deal can be put together in time—which for practical purposes means by July 1, 2007 when US Trade Promotion Authority (TPA) expires, or in such additional time as might be provided by an extension of the TPA?

Is there a commercial case for the Round?

Who is interested in the Round? In response to this question, it was noted that the lobbyists do have clients in a number of sectors and that all their clients want a big result from the Round. So there is business interest. This may be more apparent in the United States where the trade policy process is more directly business driven than in Europe, where it is very hard and time consuming for interest groups to press their views, given the layering of institutions (national governments, European Business Associations, and the Brussels bureaucracies).

The breadth and intensity of the interest is not clear, however. Some developing country observers, for example, see an "interest deficit" in the OECD countries—that is, there is no interest in opening up, especially in agriculture. Thus, it was noted, the agreement at Hong Kong to limit sensitive sectors to three percent of all tariff lines provided no assurance of market access gains since developing countries often have exports concentrated in a handful of tariff categories. The three percent carve-out could cover *all* areas of interest to many developing countries, it was suggested.

And some countries have diametrically opposed interests to improved market access—their concern is preference erosion, a major consideration for a large number of the poorest countries.

Accordingly, while it was argued that there is "money in the Round", when one tries to pull together a comprehensive perspective on interest in the Round, the result is a rather confused and not totally persuasive picture.

The political jigsaw puzzle

That being said, it was suggested that the shape of a deal that is do-able in commercial terms is reasonably well understood. Indeed, one observer argued, if the trade negotiators from the top twenty or so trading economies were to write down their view of such a deal, there would be a high degree of convergence of views. The question is whether we can get there *politically*, domestically and internationally – i.e., is there a feasible solution in political economy terms?

On the one hand, a deal that would bring the then 149 WTO Members into the fold would, it was argued, maximize the pain for the advanced countries, with greater agricultural reform in the EU and the US than had been forthcoming to date. It would also require more in the way of market access concessions from the big emerging markets than has been put on the table so far. On the other hand, a small deal would reduce the pain for the advanced countries but would not be saleable either to the US Congress or to developing countries, particularly the least developed.

Much was seen as depending on the United States and the European Union.

The situation in the United States was seen as problematic if the July 1, 2007 TPA expiry deadline were not met since the case for extension was not there. The gloomy view was that, with the Administration's approval rating in "free fall", the Democrats had no incentive to bail it out. But some held out hope that, by January 2007, with Congress re-shaped by mid-term elections and the unfolding of political and economic events, a case for extension might be made. "Trade votes, it was pointed out, have not been won on economic arguments alone: Foreign policy and security got us into this mess and will get us out of this mess". In support of this view, it was noted that, while the declining polls for the Administration have stimulated protectionist rhetoric in Congress, potential presidential candidates had largely stayed "above the fray" on trade protectionism. As well, recalling that the Uruguay Round agreement was reached shortly after the United States brought in Robert S. Strauss, an individual with a reputation as a "closer", to hammer out a deal, some expressed hopes that Ambassador Portman, an individual who was popular in Congress, might similarly be the man of the hour.[1]

As regards the European Union, some questioned whether the chief EU negotiator could actually go beyond the still-inadequate package on the table: Is the EU negotiating posture a charade, it was rhetorically asked? If not, what does Commissioner Mandelson have to do to get a change? In response, it was pointed out that, while the EU negotiating process is indeed cumbersome, the history of the Uruguay Round shows that movement is possible. The 1992 reforms to the Common Agricultural Policy (CAP) engineered by Commissioner McSherry made the Uruguay Round agreement possible, as Roundtable participants were reminded. The McSherry plan, it was observed, arose as a result of international pressure placed on Europe during the Uruguay Round (Blair House being the key meeting that set up the EU move). Importantly, it was further argued, the farm situation in France, which has been the key stumbling block for CAP reform, is changing. Popular sympathy for the CAP had historically been based on the notion that it helped small farmers: in reality, the CAP funds flow mainly to large farmers (In fact, it was indicated, the Queen of England and the Prince of Monaco have been identified as major beneficiaries). This is becoming increasingly understood, which is causing a shift in public opinion. The European poor are the main losers from the CAP and consumer attitudes against high food prices are hardening. At the same time, French farmers are becoming aware that they can become competitive (including through greater use of genetically modified crops). The French support freer trade by a margin of 60-40, it was asserted, preferring the movement of goods to the movement of people. The EU debate is thus changing and chances of a breakthrough should not to be entirely written off. However, timing is uncertain: as is the case with tectonic plates, pressure builds up and then there are sudden shifts, the timing of which is hard to predict.

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[1] Editor's note: These hopes were dashed shortly after the Roundtable when Ambassador Portman was appointed Director of the Office of Management and Budget in June 2006.

The question of time

The time required to negotiate a deal must be understood as being in part a function of the effort provided. Thus, it was argued, with an injection of some new energy and, given sufficient effort, a big deal could be put together in a short time.

However, given where the negotiations were in the immediate aftermath of the Hong Kong Ministerial, some saw the unofficial deadline of TPA expiry as, for practical purposes, having already been missed. If so, it was argued, public perceptions and the negotiating dynamic would depend heavily on whether the US Administration can get TPA extension. With TPA extension in hand, July 2007 would then be seen as the midpoint of an extended but live Round; without extension, talks might continue but July 2007 would be widely interpreted as marking the *de facto* failure of the Round: in the words of one observer, "Without the TPA deadline, things would stop."

To some observers it seemed quite extraordinary that the whole exercise *should* depend on US trade negotiating authority. Amongst the developing countries, it was noted, there is unhappiness with being in effect "blackmailed" by TPA expiry as a deadline for the negotiations.

But others argued that it was important to take advantage of the deadline provided by TPA expiry for the good of the multilateral trade system. Regionalism, it was suggested, is "at the gates".

Rounds do get done

While there was no clarity regarding the sufficiency of the commercial interests, the existence of a feasible outcome in political economy terms, or the sufficiency of time, an optimistic note was sounded by some observers. It was pointed out that rounds do get done. To be sure, there is a lot of posturing; but, in the end, negotiators cut a deal on the basis of what is on the table. For example, the last three Rounds—Kennedy, Tokyo and Uruguay respectively—resulted in tariff cuts of about 33 percent, 33 percent, and 33 percent. How hard is it to guess what the next number will be? Realistically, farmers will get their money, even after an ambitious, successful conclusion to the Round; it is a question of which "box" the money falls into and just how trade-distorting the support will be. Ultimately, the Doha Round may not be a "big" result based on *ex ante* expectations and hopes; but, it was suggested, when we look back, it will in fact be seen as a big result.

What was needed to move things forward was to connect the various elements of the negotiation—services, NAMA, agriculture and other elements—in order that the trade-offs could better be framed. In this regard, the Hong Kong Ministerial had established a useful common deadline of July 31st 2006 for progress on agriculture and NAMA and for the first real services offers. Further, it was noted, the plurilateral approach that has been adopted for services is happily also a sectoral approach; this can drive a constructive dynamic and lead to a different kind of negotiation based on sectoral specifics.

To summarize, in response to the question "Is the Round doable?", the discussion yielded an answer that might best be characterized as "The Round is not undoable."

Development: the Major Conundrum in the Round

Without a doubt, development has been the most contentious and ultimately confused aspect of the Round. Some saw this as a congenital defect in the framing of the Doha Development Agenda (DDA); according to this view, the Round had been misconstrued from day one.

Some of the confusion reflects the fact that it was, as one observer put it, "a masterpiece of constructive ambiguity".

However, it cannot be ignored that the choice in Dubai in November 2001 had been to have a development round or not to have a round at all. The Round was launched on the basis that it would provide a response to the North-South divide that had emerged from the outcome of the Uruguay Round—regardless of whether the emergence of this divide was an unintended consequence or a reflection of the power imbalance in the negotiations, a point on which views differed. The problem lies therefore not so much in the origins of the Round as in the lack of agreement as to what the Round was to deliver with respect to development.

Trade and Development: Clarifying the Link in the Doha Round

As one observer put it, the term "trade and development" is somewhat like a Rorschach test: everyone sees something different. To some it means agriculture, to others it means "aid for trade" (or capacity building), to others it is about preserving policy space, and to others it is about market access (supported as necessary by capacity building). That being said, observers from both the developed and developing worlds argued that considerable progress had been made in clarifying the ambiguities papered over at Doha. As one observer put it, the use of the development label for the Doha Round did create confusion but we are now almost out of those woods.

In this regard, it was argued that the development community has come a long way in recognizing that development is very complex and largely domestic. While trade liberalization is seen as an integral part of restructuring economies to take advantage of globalization, the idea of a trade round driving development, it was suggested, has the tail wagging the dog. The practical problems facing the would-be exporter in a typical developing country—e.g., long delays and theft of goods in transit—are not matters that the WTO can deal with. Similarly, WTO rights and obligations represent only a small part of the development function—for example, it was noted, it is not the handful of artists in developing countries who actually have foreign sales who need intellectual property protection but rather the thousands who work in the domestic market who do not.

Moreover, it remains difficult to bring development into the mercantilist negotiating framework of a trade round. For example, it was suggested that there was a fundamental lack of coherence in the framing of the negotiations: the development dimension of trade is identified with market access but market access also means own progress on policy reforms (since a tax on imports is a tax on exports) and the least developed countries were to be given a free pass in this regard. It is an optimistic view, it was suggested, that sound development outcomes could nonetheless be achieved through greater cooperation between the World Bank and the WTO processes such as the discussion of policy frameworks supported by trade-related technical assistance (TRTA) in the context of the "integrated framework". The integrated framework, it was suggested, is not working. For one thing, it is hard to sort out when aid is just "aid" and when it is "aid for trade"—not to mention when it is "new" and when it is just "re-profiled" existing money (the sense of some observers is that there is actually little if any new money). It was pointed out that "aid for trade" would involve earmarking aid, which goes against the last five years of World Bank policy against such earmarking. And there is a confusion of programs—Aid for Trade, Poverty Reduction Strategy Papers (PRSPs), and Millenium Development Goals (MDGs) are all overlapping frameworks for disbursement of aid.

Given the current perspective, some observers found it hard to imagine that the notion of trade ministers delivering "development" was ever taken seriously. This would require, it was suggested, a level of coordination of domestic agencies that is difficult, and of international agencies that is impossible, to achieve. A multilateral trade agreement was not going to be the catalyst for such a coordination of effort.

In turn, it was argued, this more realistic perspective has brought a new-found clarity as to what development now means in the Round. Conceptually, it was argued, the term "development" in the Doha Round context must be recognized to mean development as understood by trade negotiators rather than by the development community. That is why development in the Round is associated so closely with agricultural trade; the WTO is the forum in which agricultural trade is best negotiated and that is the area where the trade negotiations have the greatest leverage on the development function—even if agriculture might have been "oversold" as a development tool. Thus, at a minimum, development in the Round means increased market access in agriculture, which is what was not obtained in the Uruguay Round and which continues to be lacking in the Doha round.

Further, the idea of "policy space", problematic as it may be to those who see a major benefit to a country from the acceptance of trade disciplines, is now accepted. The Hong Kong Declaration reflected agreement on buy-outs in the TRIMs agreement for local content, performance requirements and so forth. This provides practical policy space. It was argued that we need to "declare victory" in the WTO on this issue and get on with the real WTO agenda which is market access.

To be sure, it was acknowledged that market access, while necessary, is not sufficient. A distinction needs to be drawn between what might be termed "market access" and "market entry". Improved market access under trade rules (i.e., through tariff reduction) can be negotiated but this does not guarantee market entry which also depends on the ability of an exporter to comply with the various standards that products must meet (SPS, TBT, ISO, Walmart specifications, etc.). And the costs of compliance are high. Capacity to take advantage of market access concessions obtained in negotiations is thus also necessary.

However, it was argued that capacity building is really a sideshow for the WTO, notwithstanding the fact that it has become the centerpiece of the discussion of trade and development in the negotiations: the bottom line is that the WTO cannot provide funds for restructuring but can deliver market access, starting with agriculture but including non-agricultural goods and services. In this sense, the label "development" has become a liability for the Round, distracting attention from the central WTO agenda.

Risks to the Multilateral System from A Failed Round

Paradoxically, the reappraisal of the role of trade liberalization in development is taking place at a time when the more dynamic developing countries have gained a major stake in the multilateral system and the least developed countries (LDCs) have arguably taken over from the United States and the European Union as the custodians of the multilateral system. There was a time when the least developed (LDCs) feared the WTO. Now, it was suggested, the LDCs have bought into the notion of a rules-based system and are happy to play the WTO game while the developed countries are avoiding engagement.

This situation highlights a problem in the political economy of the Round.

The great byproduct of the trade and development linkage, it was suggested, has been to force a more sophisticated examination of the distribution of global welfare gains from liberalization and of the development impacts of particular aspects of agreements. In the course of this examination, it has become apparent that LDCs face a real risk of no welfare gains from a deal due to the negative effects of preference erosion and higher food prices (the vast majority of LDCs are net food importers). Indeed, the perverse result of this situation is that the more engaged the LDC is in exports, the greater the welfare loss from deteriorating terms of trade.

At the same time, it was suggested that the huge beneficiaries of agricultural liberalization would actually be the industrialized countries, where food prices would be lower. But the ground work to prepare the case for agricultural liberalization based on the actual nature of the benefits has not been done.[2] Nor, it was suggested has adequate homework been done in the industrialized nations to explain to farmers what agricultural trade liberalization means and how government will support incomes—it is possible, it was pointed out, to be generous to farmers in non-distorting ways.

Meanwhile it was argued, the major emerging markets—China, India and Brazil—have not been making the contribution commensurate with the benefits that they have been getting from the system.

This combination of interests and engagement, it was felt by many at the Roundtable, did not augur a successful conclusion to the Round. The EU and the US will not provide the leadership to shore up the multilateral system but the emerging markets and the LDCs are not ready to take over leadership.

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[2] As a footnote to this discussion, it was noted that this is not a new situation: the Uruguay Round launch effort included a visit to Japan to demonstrate the benefit of low food prices. But it didn't work – however, this effort met with an argument that meat prices in Japan were high because Japanese consumed so little meat!

This is problematic since, in the consensus view, there seems to be no alternative to the multilateral system to address many key and still unresolved issues that continue to disturb the smooth functioning of the global trade system.

First, an agreement could help clarify systemic questions raised by the present lack of a coherent view of where the multilateral system is going. The consensus on embedded liberalism has collapsed. The old multilateral framework based on the GATT has evolved into something more than just a trade system; as one observer put it, it is at present a strange and unbalanced amalgam with the "rights" of one factor of production—intellectual property—being protected but not others. There is no consensus on this "system". It is driven by ad hoc, episodic liberalization, mingling foreign policy with economics—"episodic ad hocery" one might call it. At the same time, it was argued that the broader systemic issues could not be handled within the WTO negotiations alone. The ability to achieve consensus within a group of 149 Members[3] is limited; this constrains the areas on which the WTO will be able to move. Hence labour, investment, etc. cannot be built into the multilateral framework in any significant fashion. Other mechanisms are needed for these areas.

Second, without an agreement, the WTO would be weakened as an institution—it would be a ship without a rudder. The momentum for reform would be dissipated and the WTO's ongoing role as "overseer" of the multilateral system would be weakened.

Third, the dispute settlement mechanism in particular needs an agreement. Without the "legislative" guidance provided by a broad agreement amongst the Members, the evolution of the system would increasingly be based on decisions by the judicial arm through settlement of disputes. This raises new issues since, with the expiry of the "Peace Clause" in the Agreement on Agriculture, the subsidies agreement also applies to agriculture. The proliferation of RTAs is also affecting the scene for dispute resolution by providing, in some instances, for a choice of forum in which to pursue dispute settlement.

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[3] Editor's note: the number of WTO Members has since increased to 150 with the accession of Vietnam on January 11, 2007.

Fourth, if the Doha Round were not successful, the scene of action would shift increasingly to the arena of regional trade agreements (RTAs). However, it was noted, RTAs themselves are embedded in the multilateral system. The WTO is needed to provide some discipline over the formation and operation of RTAs, especially in respect of rules of origin (ROOs). Multilateral tariff elimination would of course clean up the ROOs mess. Moreover, some things cannot be done in bilateral agreements, in part because of free rider problems and in part because the big players cannot deal with each other in a bilateral context. For example, it was noted, the EU and Mercosur have found it difficult to deal with sugar because of the nature of that market. This drives RTAs towards small deals. Further, RTAs are not uniformly successful in leveraging greater trade (south-south RTAs appear to have had a weak track record) for those that can conclude agreements while raising a problem of exclusion and preference erosion for those that cannot. Finally, it was remarked that, if trade is about integration into global supply chains, RTAs are not helpful, they in fact are the opposite—they can restrict access.

In short, there is no perfect substitute for the WTO; some things will get done in the WTO or not at all. The cost of failure of the Round would be damage to the WTO's credibility which would represent an important system failure. The resulting drift would expose the system to developments, which could include disruptive change—including protectionist action against China, significant currency realignments and so forth.

Conclusion

With the window of opportunity for a timely successful conclusion to the Doha Round rapidly narrowing following the Hong Kong WTO Ministerial, close observers of the international trade scene underscored the need for a comprehensive agreement to shore up the multilateral system, identified necessary next steps to bring about such an agreement and, notwithstanding numerous obstacles, pointed to reasons to believe that such an agreement could in fact be achieved. At the same time, the political economy of the Round was not seen as especially propitious for a successful conclusion; expectations were accordingly being trimmed (e.g., to a "Doha lite" outcome) and an extended hiatus was seen as a very real possibility, exposing the system to additional pressures and risks. Any optimism about a successful conclusion to the Round was thus qualified.

Events over the course of 2006 initially tended to validate the more pessimistic assessments of prospects for the Round but subsequently started to reflect the more hopeful views.

It's never over till its over.

Part II

A Conference on Integrative Trade

Integrative Trade: Issues for Trade Analysis, Statistics and Policy

Christopher Maule*

On December 6, 2006, the Centre for Trade Policy and Law at Carleton University organized a conference on the theme "Integrative Trade between Canada and the United States—Policy Implications". The discussion was structured around three main papers, which constitute the next three chapters of this volume:

- *Timothy Sturgeon,* "Conceptualizing Integrative Trade: The Global Value Chains Framework", *which provides an overview of the state of development of multi-disciplinary research on the evolution of global value chains;*
- *Art Ridgeway,* "Data Issues on Integrative Trade between Canada and the US: Measurement Issues for Supply Chains", *which examines the issues posed for statistical agencies in grappling with the changing international industrial landscape; and*
- *Michael Hart and William Dymond,* "Trade Theory, Trade Policy, and Cross-Border Integration", *which examined the implications of these developments for the trade policy community.*

This note sets out the background which motivated the organization of the conference and describes some of the concepts which shaped the discussions.

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Introduction

International commerce is being re-shaped by the fragmentation of the production process—the splitting up of the stages of production and locating them in different places in the global economy—and the resulting expansion of trade in intermediate goods and services and inward and outward investment. Glen Hodgson refers to this as integrative trade[1]

In discussing integrative trade, new terms have entered the lexicon of industry studies, such as outsourcing, offshoring and supply chain management. Previously, the concepts of just-in-time production and total quality management were introduced to the analysis of industries. Do these new terms point to new phenomena or do they simply represent new labels for familiar activities? What implications does integrative trade have for the statistical agencies charged with measuring international commerce? And what issues do these developments raise for the conduct of trade policy?

To set up the discussion of these issues in the next three Chapters, this note describes some of the terms which have come into increasingly general use in discussing modern international commerce, looks at how different disciplines address the ways in which industries are organized to see if they throw light on policy issues, and notes some of the issues associated with data sources and what further research might be needed.

Some Terminology

Outsourcing and Offshoring

In public discussion, outsourcing refers to situations where firms purchase inputs from other firms as opposed to producing the inputs themselves. It is further refined to distinguish between outsourcing that takes place at home and abroad. Foreign outsourcing is referred to as offshoring. A further distinction is made between outsourcing from a plant owned by the firm making the purchase or from an independent firm. Thus there are four possible cases:

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[1] Glen Hodgson, "Trade in Evolution: the Emergence of Integrative Trade," EDC Economics, March 2004, p. 5. See also Hodgson, "Integrative Trade and the Canadian Experience," EDC Economics, May 2004, both accessed at www.edc.ca. Other references to concepts surrounding integrative trade are found in the conference papers.

1. Firm in Country A purchases from one of its plants in A
2. Firm in A purchases from an independent firm in A
3. Firm in A purchases from one of its plants in Country B
4. Firm in A purchases from an independent firm in B

All four cases involve some degree of outsourcing but only Cases 3 and 4 are offshoring. Cases 1 and 3 involve intra-firm transactions and transfer pricing but only in Case 3 does transfer pricing involve international trade. Case 4 involves trade but not transfer pricing since the transaction is arms-length between buyer and seller.

In business terms, outsourcing is part of the ongoing evaluation that a firm's management makes about whether to make or buy inputs when determining the most cost efficient way to organise production. As conditions change in different markets including changes in technology the make-versus-buy decision is reviewed.

As examples, offshoring in manufacturing takes place when a Canadian shoe retailer purchases shoes made either by its subsidiary plant in India, or by an Indian owned manufacturer. In the resource sector, Alcan supplies its Canadian smelters with bauxite and alumina from abroad, either from its own plants or from independent suppliers. It has no option to offshoring for these inputs as there are no commercial deposits of bauxite in Canada, but what Canada has is the energy needed to convert alumina into ingot.

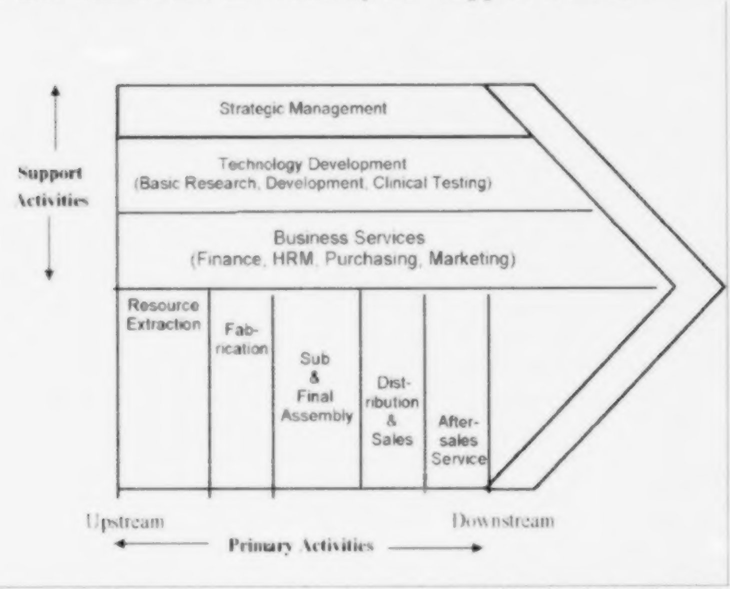
Offshoring in the service sector has received much of the public attention to date, in part because information technology has made it easier for firms to contract out for service activities abroad that were previously performed at home. Thus North American firms locate call centres, software programming activities and finance and accounting functions in countries such as India and the Caribbean. Technology has made it possible for many service activities to be much more footloose.

Public debate has focused on the employment impact of offshoring which represents only a part of the economic impact. There is nothing new about the general process of offshoring except that technological change now means that it affects a different and wider set of firm functions. In the past textile jobs migrated from North America to Asia due to lower costs in Asia, today accounting and programming jobs are migrating out due to lower costs made possible by technological change. In resource-based activities, such as agriculture and minerals, the extent of outsourcing depends on where the raw material and its final market are geographically located. The statement by Greg Mankiw that "services offshoring is just another form of trade," reflects the situation that technology now allows offshoring for a new set of activities affecting different occupations than was previously the case for offshoring manufacturing and resource activities.

Supply Chains

Supply chains describe the stages of production organized by firms to manage its operations. Managers purchase inputs which are then converted through value-added stages of the production process into outputs for sale to other firms as intermediate goods or to final consumers as end products. For example, steel firms have a supply chain of inputs that leads to the production of steel for sale as intermediate goods to automotive and other firms. Automotive firms purchase steel and other inputs for manufacture and assembly of cars for sale to final consumers. Part of manufacturing production involves tangible goods but production also requires service activities such as R and D, design, planning, finance, advertising, labour relations, transportation, and storage. Each of the required inputs of goods and services can be subjected to the make-versus-buy supply chain decision that can influence whether or not it is outsourced and if outsourced whether it is off-shored. The stages of a typical firm's organization are shown in Diagram 1 (below) in terms of a firm's primary and support activities, each of which has the potential to be located in a particular place.

Diagram 1:
Value Chain of Firm's Primary and Support Activities


Strategic Management
Technology Development
(Basic Research, Development, Clinical Testing)
Business Services
(Finance, HRM, Purchasing, Marketing)
Support Activities
Resource Extraction
Fab-rication
Sub & Final Assembly
Dist-ribution & Sales
After-sales Service
Upstream
Downstream
Primary Activities

Source: L. Eden. Strategies Of North American Multinationals In The New Regionalism. At http://www.carleton.ca/ctpl/conferences/index.html#tradeinvest

The supply chain or the successive stages of production for a firm will vary by firm and industry. The stages are sometimes referred to as the value chain and thus use is made of such terms as supply chain management or value (sometimes value-added) chain management. In economic literature on industrial organization the term vertical integration is used to describe the supply chain. Vertical integration refers to the extent to which stages of the production process are contained within a firm. Thus supply chain and vertical integration refer to similar aspects of a firm and industry. In economics there is an extensive literature that discusses aspects of vertical integration, while supply chain management is often used in discussions of business policy.

Just-in-Time and Total Quality Management

Two other terms used in management literature, just-in-time (JIT) production and total quality management (TQM), relate to aspects of the supply chain. JIT refers to the way in which goods move from one stage to another in the production process. If the item produced at Stage 1 is required as an input at Stage 2 of the production process, then Stage 1 output can be produced and stored ready for use at Stage 2 in which case there are inventory costs between the stages. Alternatively, the output at Stage 1 can be produced just in time for use at Stage 2, thereby reducing inventory costs. But organizing production in this way may give rise to other costs. Suppose there is an interruption in the supply of Stage 1 output, then, with JIT production, Stage 2 has to cease operating as there is no inventory to call on. The reduced costs of holding inventory can be offset by the risk and costs associated with production stoppages. Interruption can occur for numerous reasons such as defective parts, the breakdown of machinery or the failure of deliveries to arrive. If these deliveries involve cross-border shipments then customs clearance must occur.

TQM refers to the idea that if there is 100% checking of inputs for quality in production processes then the stages of production will flow more smoothly, reducing or eliminating the need for inventories of parts at each stage in the process. TQM supports the functioning of JIT and reduces costs of operating and managing the supply chain. TQM may involve higher costs of monitoring product quality but can reduce inventory costs.

Technology and the Supply Chain

Along with economic and population growth, technology has had an impact on the worldwide growth of international trade in a number of ways especially relating to transportation and communications. Lower transportation costs have occurred in maritime shipping through containerization, in railways with the use of high speed and unit trains, in pipelines used for liquids and solids, and in air transportation with jumbo jets and Fedex-type overnight delivery services.

In communications, digitization means that information of all types (print, audio and video) can be coded as digital signals and shipped by wired and wireless means. Activities that were previously undertaken within or close to a manufacturing plant can now be done more cheaply at a distance. Call centres are located in India and the Caribbean for companies located in North America and Europe; clerical services for insurance and financial companies are dispersed around the world; software programming, consulting, accounting and other service activities are now more easily traded. The services segment of the labour force that previously was partly protected from foreign competition now, because of technology, faces competition from cheaper labour in other countries.

Activities that were once considered as being non-tradable are now traded. Examples of non-tradable activities include services like haircuts, restaurant meals and funeral parlours where the supplier and customer have to be in the same place, but even in these cases a customer in one country can travel to the supplier in another to receive the service. The supply of medical tourism is precisely this with the patient traveling to medical facilities in another country and is reflected in the GATS Mode 2 form of service supply. While some service items may be difficult to trade, most can be subject to some form of trade and technology increases the likelihood of trade.

Supply chain changes over time

The term Fordist production refers to the early organization of vertically integrated automotive firms, a format initially copied by Toyota and other Asian car manufacturers. With Fordism, the design of an automobile, manufacture of parts, assembly, sales, financing and promotion were all conducted by the same firm. It might have many departments and divisions by functions and products for its primary and support activities but these were coordinated domestically and internationally by a head office. Such a firm could become multinational with some functions and products undertaken abroad. Many firms in natural resource and manufacturing developed in this way.

The same Fordist vertical integration was the case initially for firms in many service industries such as banking, advertising and management consulting. Over time, as a result of changing costs conditions including the effects of trade barriers and policies affecting the ownership of foreign direct investment, the cross-border movement of persons and the licensing of technology, these vertically related structures became modified and the supply chain altered as ways were found to reduce costs.

At the other end of the Fordist spectrum are companies that own few assets. They design products, arrange for their manufacture by others and organize delivery of the products to customers who also receive post-sales service arranged by the company. Dell Computer is one example—see Box 1 below. It designs computers based on parts such as Intel manufactured processors, hard disk drives and flat screens produced and assembled elsewhere. Dell receives orders from customers that it transmits to its manufacturers who in turn order the components needed to assemble the computers. It then arranges for shipment and for the provision of call centres to support customers and provide for warranty service. Production and inventory management are activities that tie up capital and expose the company to financial risk as sales fluctuate. By performing only a few of the vertically related functions and merely coordinating the others, Dell reduces but does not eliminate its exposure to risk. It has few of the direct costs of production but it depends on the reliability of suppliers for the quality and timely delivery of their products. While some costs are reduced there exists the potential for others to increase. WalMart and Ikea are other examples of firms that follow this model for some of the products they sell to consumers. Kenney and Florida (2004) provide other industry examples of firm locational decisions.

Box 1: In 2005, a Dell laptop was designed in Texas and assembled in China. It had its keyboard made in China, the motherboard in Malaysia, the flat screen in South Korea, and the software was compiled in the US, India, Sweden and Russia. The product label stated "Made in China," although establishing nationality seems to be an arbitrary process (Gave, 2005:10)

In order for a more vertically disintegrated or fragmented approach to industrial organization to work, an efficient communications and transportation infrastructure is needed as well as the absence of government policies that impede the cross-border movement of trade in goods and services. There also has to be a level of trust between buyer and seller and confidence in the judicial system to settle fairly any disputes that arise.

These examples illustrate how technology permits different ways of producing, distributing and coordinating industrial activity, that is different ways of organizing an industry's supply chain. As change occurs, some goods and services disappear or diminish in importance such as the typewriter, black and white television set, and postal services, while others increase such as email communications and the transfer of digital files of audio, video and print materials. For example, copies of print encyclopaedias still exist but new ones are hard to buy, while online versions such as Wikipedia are competing with print versions. Each firm examines it supply chain to see how technology can be introduced to reduce costs and make the firm more competitive.

Offshoring and supply chain management is also related to policies affecting the movement of labour. If North American firms outsource clothing manufacture to Latin America and China because of lower labour costs, one alternative would be to import labour to North America to do the work. This happens and is reflected in the temporary work visas given to migrant workers in North America as well as the inflow of illegal workers; the estimated number of illegal workers in the US is currently 11 million. In some instances the configuration of the industry supply chain allows work to be sent to the workers as in the case of call centres, while in others the workers have to come to the work as in the case of harvesting agricultural products where mechanization may not provide as efficient an alternative.

Disciplinary Approaches to Industry Studies

Literature that examines changes in industrial organization can be found in economics, business administration, geography and sociology as well as in discussions of trade policy. Each discipline has its reasons for making such a study and a particular framework and terminology for its analysis. Students of economics, business administration, geography, and sociology study industries, but through different lenses and for different reasons. Each examines a series of issues some of which are overlapping and some unique to the discipline's focus. One common denominator is industrial organization, but that term is used for different purposes. For example, economics stresses issues of competitiveness and efficiency, business administration the overall performance of firms, geography the location of production, and sociology issues such as industrial development and poverty alleviation. Before exploring these disciplinary differences, we outline what is meant by some frequently used terms.

Economics

The field of microeconomics contains the subfield of industrial organization that examines the way in which firms can be grouped into industries in order to assess the extent of competition and the consequences for society of competitive conditions, for example when markets exhibit different degrees of monopoly power with the ability to influence prices[2]. A main concern of economics is the efficiency of resource use. Its focus on market power is because less competitive markets are likely to result in a waste of resources from the viewpoint of society as a whole. Among the main factors considered in industry studies are:

- The importance of economies of scale influencing the extent of horizontal integration.
- The extent to which firms are vertically integrated thereby owning stages in the production process, for example in the oil industry the stages of exploration, production,

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[2] Industrial organization in economics has two dimensions, the organization of firms within industries and markets which leads to a focus on competition, and the organization of the firms themselves by functions, by divisions and departments and as domestic and multinational firms. The two are related in that the efficiency with which a firm is organized will affect its ability to compete in a market.

transportation, refining and distribution of refined products for sale to final consumers.

- The degree of product differentiation examines whether a firm produces one type of product, such as small cars, or a range of products, such as small, medium and large cars, trucks and buses. The extent of competition with other producers can vary depending on the range of products produced by each producer. This dimension is also referred to as diversification, but diversification can be both by product and by regional location. Note, vertical integration can also be considered a form of diversification by stage of production as opposed to by end product. The concept of scope economies is used to help explain the extent of diversification within a firm.
- The ease with which new firms can enter a market where the firms may be either newly established or firms in another industry that diversify into a new industry; and the ease with which failing and other firms can leave the industry.

Industrial organization is not especially concerned with where a firm locates the various stages of its production process, an interest that falls more within the economic fields of international trade and investment. A combination of cost factors associated with the above four sets of economic conditions and the effect of political boundaries will be major influences on where activities are located geographically.

Note that economics distinguishes between an industry and a market—see Box 2. The cement industry in Canada may be represented in all regions of the country but it consists of separate markets. For example, for reasons of transportation costs, cement producers in Atlantic Canada and British Columbia will find it difficult to compete in each other's markets. This is an example where scale economies in production may be offset by freight costs of reaching consumers leading to more and smaller plants than might exist in a market with higher population density. Distance becomes an important factor in how a firm organizes its activities.

Box 2 : A market refers to a situation where producers of like products (goods and services) compete for sales to a common group of buyers. An industry includes all producers of like products regardless of whether they sell to the same customers. The restaurant and hairdressing industries have numerous producers nationally and internationally but each is made up of many markets where a supplier competes for customers with a limited number of other suppliers in a geographic space. At the other extreme, the segment of the software industry that provides operating systems for computers has only a few producers, Microsoft being the principal one, that supply customers in all parts of the world. Here the industry tends to coincide more closely with the market unless government policy creates some barrier to trade. With the imposition of tariffs, producers tend to locate production behind the barrier thereby fragmenting the organization of production that would occur in the absence of a tariff.

In industrial organization studies, the concept of the miniature replica effect refers to situations where one or more stages in the production process, for example manufacture and assembly in the case of automobiles, is divided between geographic locations because barriers such as tariffs may prevent concentrating production in one place and the attainment of scale economies. With the lowering of tariffs assembly can often occur in fewer places with trade as opposed to foreign investment servicing different markets. Trade associated with outsourcing focuses on production of each stage of the industry's supply chain with each concentrated in a certain location (for example shirt manufacture in China) and then shipment to the next stage. Outsourcing may permit scale economies in the production of each stage of the supply chain but depends on domestic and/or international trade to connect with the other stages. Outsourcing is a way of overcoming the inefficiencies due to the miniature replica effect but can only occur if there are no artificial barriers to trade.

Business Studies

Faculties of business share many interests with economics but business studies focus more on factors concerned with managing the firm, thus they offer courses on topics such as production, finance, marketing, strategic planning, organizational behaviour, and advertising and promotion. Their interest is in the factors leading to firm success measured in terms of return on investment regardless of whether this is associated with competitive or monopolistic market conditions.

Discussion of strategic and tactical decision-making and planning is an important concern of business studies and leads to examination of the organizational structure of the firm in terms of factors such as make-versus-buy, outsourcing, offshoring and the extent of vertical integration and diversification. All these terms relate to the idea of supply management.

Geography

In contrast with the concerns of economics on questions of efficiency and competitiveness, and of business studies with reasons for firm performance, geographers are often more interested in explaining the location of industrial activities. They look at the same set of activities but with a different focus. The economics of agglomeration is used to explain why particular industries cluster in certain areas, for example film and television production in Hollywood and Mumbai, financial services in London, New York and Tokyo, hard disk drive assembly in Singapore, semiconductors in Silicon Valley, and the manufacture of clothing in China and Mexico.

The location of natural resource and agricultural production are strongly influenced by resource endowment and climate, but manufacturing and service activities often require a different explanation. Any country (location) could have a film industry, and many do, but production tends to be concentrated in certain places. The US, India, Egypt, Hong Kong and Nigeria are examples of locations where a significant amount of film production occurs, but the technology required to make films is widely available.

Geographers look at the process of agglomeration or the benefits of grouping similar or related activities in the same location. Film production requires a wide range of support activities such as sets, props, carpenters, technicians, costumes, hair dressers and makeup persons, stunt performers, animals, scenery, composers, and musicians, in addition to producers, directors and performers. Once production in a location reaches a critical size these inputs are attracted to the production site and become available for a number of film companies. The benefits of locating in one place provide reasons for the structure of industry organization that occurs. The contribution of geography to explaining industry organization is similar and complementary to the approach taken by economics.

Like other disciplines, geographers focus on the supply chain or the vertically related stages of an industry's production process but with emphasis on where each of these stages is located, as opposed to the economist's concern, for example, with efficiency and competitiveness. The concepts of vertical integration and supply chain are similar if not identical although they tend to be used for different purposes by the different disciplines.

Sociology

Work by Garry Gereffi and others have focused on the organization of industries (Gereffi, 2005:79)

> "...the starting point for understanding the changing nature of international trade and industrial organization is contained in the notion of a value chain, as developed by international business scholars who have focused on the strategies of both firms and countries in the global economy. In its most basic form, a value-added chain is 'the process by which technology is combined with material and labour inputs, and then processed inputs are assembled, marketed, and distributed. A single firm may consist of only one link in this process, or it may be extensively vertically integrated...'(Kogut, 1985:15).

Concepts used in this analysis that overlap with other disciplines are the significance of transaction costs, the vertical disintegration of multinational corporations, core competencies of firms, the growing international trade in components and intermediate products as opposed to final goods and services, information flows and the variation in value chain governance from markets to hierarchies.

In contrast to the efficiency concerns of economists and the locational interests of geographers, sociologists have emphasized factors that affect "... not only the fortunes of firms and the structure of industries, but also how and why countries advance—or fail to advance—in the global economy." Their interest is in crafting "...effective policy tools related to industrial upgrading, economic development, employment creation, and poverty alleviation. (Gereffi, 2005: 79). The aim is to explain how particular industries can assist in a country's economic development. The extent to which stages in a production process can be located regionally provide opportunities for the dispersion of production in different parts of the world and to countries at different stages of economic development.

Other Disciplines

Disciplines such as law and political science also have an interest in industrial organization. Corporations are the principal form of organization for industrial activities. Corporate and contract law are vital to an understanding of how firms operate and do business with each other as are the branches of law dealing with bankruptcy, taxation, labour, the environment, trade, investment and intellectual property. Politics is concerned with the concept of power. Corporations are able to exercise power in numerous ways thereby affecting the sovereignty of states, a topic examined by political scientists.

Outsourcing, Offshoring and Supply Chains: Data Issues

Public discussion of outsourcing stems mainly from its employment impact that now, due to technological change, affects services as well as goods. Debate is reinforced by statements that industrialized economies are primarily service economies with around 70% of employment being services related, while declining employment shares are associated with the manufacturing and resource sectors. What does this mean and how is it measured?

The distinction between goods and services is enthroned in public debate, in data on production, employment and trade and in the WTO with the GATT disciplines for goods and GATS for services. Underlying the distinction are some difficulties. The production of a good, such as an automobile or a pair of shoes, involves the production of tangible objects, while production involving financial, medical and engineering advice involves an intangible output. The production of music illustrates a combination of good and service. When transmitted over the air, a song is a service; when embodied in a disk, it becomes a good. Should music then be considered the production of a good or service or both?

It is not clear that the automobile and shoe examples are pure goods. If finance, advertising, transportation and warehousing are service activities, all are associated with and can take place within a goods producing firm. If the firm is classified as goods producing it is because most of its value added activity is associated with the tangible side of the product and not with the intangible service inputs. Assume that the firm decides to contract out for some or all of its financial, advertising, transportation and warehousing requirements thereby reducing its work force, the final output of the firm may remain the same but the configuration of inputs used to produce the output has changed. The firm now out-sources for these services which when counted separately make it appear that the service sector has expanded at least in terms of employment.

What has actually happened is that the services once performed within the manufacturing firm are now contracted out with a contraction of manufacturing employment and an expansion of services employment. Management is continually engaged in reconfiguring the firm's supply chain in order to reduce costs and remain competitive. In so doing the national economy may appear to become more service oriented when in fact little has changed. Data on employment by occupations should provide more accurate information of what has actually changed. It may well be the case that developments in information technology have led to the need for more persons to be engaged in the provision of programming services, the operation of call centres and the supply of repair services, in which case the occupational structure of an economy's labour force may change with a greater emphasis on services. Some combination of the needs of new service industries and the reconfiguration of production within existing goods producing industries probably accounts for the larger percentage of persons employed in services, and the finding that economies are becoming more service oriented. Data should be able to provide a more precise description and explanation of these. What do the data show?

The answer is not clear but the work needed to provide an answer is set out in a recent report published by the Industrial Performance Centre at MIT.[3] It concludes that in the case of the US, there is an absence of adequate data on services traded internationally; a similar absence of data on domestic trade in services; and a lack of adequate data on employment by occupation and industry. Until such data become available, it will be difficult to assess accurately the extent of outsourcing and offshoring by industry and the trade and employment impacts. The MIT study notes that the classification system for traded items includes 16,000 categories for goods versus only 17 for services. Similar discrepancies exist for goods and services traded domestically within the US and for the occupations associated with goods and services production. Goods trade has always been easier to measure because a tangible object is involved for which customs paperwork is required before it can cross a border to its destination as an import. Exports usually have no such requirement and their record may depend on surveys taken in the seller's country or import data supplied by the buyer's country. For example, for goods exports to each other, the US and Canada rely mainly on import data from the other country. Measurement of services trade depends largely on surveys conducted in each country with all the problems associated with ensuring that the surveys are completed[4].

The under-reporting of the service sector is tied up in part with the underground or informal economy whose size varies by country but even in the case of a developed economy such as Greece is large. A recent report in the *Financial Times* (Sept.

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[3] "Services Offshoring Working Group, Final Report," lead Author T. J. Sturgeon, September 10, 2006, MIT Industrial Performance Center http://web.mit.edu/ipc/publications/pdf/IPC_Offshoring_Report.pdf.

[4] In the US the threshold for collecting services trade data has been \$6m per annum for imports and \$8m per annum for exports.

29, 2006) noted that "Greece suddenly found itself 25 per cent richer on Thursday after a surprise upward revision of its gross domestic product, the fruit of a change to national accounts designed to capture better a fast-growing service sector including parts of the black economy such as prostitution and money laundering."

With services, there is considerable domestic and international trade conducted for no charge or trade that may be underreported. Users of Skype make telephone calls in Canada and abroad for no charge. Foreign published newspapers and journals are read for free on the Internet. International calls are made by using a phone card whose value is probably not captured in services trade data. These are examples where border policies have little or no impact on trade. For trade in goods, borders are a much more significant issue.

Conclusions

A new and complex international commercial landscape is emerging, which is spawning new concepts and new terminology, creating new demand for improved statistical measurement, and raising questions for traditional trade policy and practice. It is timely that these issues be aired in Ottawa, as Canada seeks to consolidate its place in the North American production platform and enhance its role in the global division of labour.

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Conceptualizing Integrative Trade: The Global Value Chains Framework

Timothy J. Sturgeon[*]

Introduction

The global economy has entered a new phase of deeper, more immediate integration that is exposing national and local economies to the winds of global competition as never before. These winds can fill the sails of our domestic firms and industries, or blow them away. Peter Dicken (1992: 5) has argued that an earlier era of 'internationalization,' characterized by the simple geographic spread of economic activities across national boundaries, is giving way to an era of 'globalization,' which involves the *functional integration* of these internationally dispersed activities. It is this functional integration that drives our growing interest in 'integrative trade.'

What is it that enables greater functional integration in the global economy? Two key differences with the past are rapidly increasing industrial capabilities in developing countries, capabilities that reside both in local firms and the affiliates of multinational firms, and new computer-mediated approaches to real-time integration of distant activities. These new features facilitate international trade in many intermediate goods and services that have not previously been sent across borders. As a result, opportunities have opened up for firms to engage with the

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global economy—as buyers, suppliers, sellers, distributors, contractors, and service providers—in ways that were impossible even a few years ago. However, recent changes have created new challenges and risks, as well as opportunities. The growth of integrative trade has served to expand the arena of competition beyond final products to the vertical segments and business functions within and across industries, raising the performance requirements for firms that may have been more insulated from global competition in the past.

The implications for policy are profound. How can workers, firms, and industries be provided with the best environment for engaging with the global economy? How can we be sure that enough wealth, employment, and innovative capacity are generated at home? These are open questions. Even if policy-makers seek no interventions in the areas of trade or industrial policy, global integration can make the process of economic adjustment more difficult because it accelerates the pace of change. Trade adjustment, education, taxation, innovation, and infrastructure are all policy areas in which we need to consider the effects of integrative trade. The problem lies in our shallow understanding of the process and of its specific effects.

In this paper I argue that global integration signals an urgent need to develop new conceptual tools. Effective policy responses require a clear, detailed, and timely view of global integration and related economic changes based on solid economic data. Good economic data also provide appropriate market signals for companies, workers, students, and educational institutions. Current economic statistics, at both the level of countries and globally, are clearly not up to the job (see Sturgeon et al., 2006). But we need more than more and better economic data. We need to restructure our thinking about mechanisms and outcomes in the global economy.

This paper is organized as follows. First, I outline five trends that are working to accelerate the pace of global integration. Then, I argue that an understanding of the core dynamics of global integration requires deep qualitative knowledge of the details of specific industries. Nevertheless, the results of such industry-specific qualitative research will remain of limited utility unless they can be generalized in a way that renders the insights they provide industry-independent. As a way to begin to fill this gap, I offer the "Global Value Chains (GVC) Framework," an industry-independent conceptual model that highlights two critical aspects of integrative trade that are not captured by current economic statistics: *power and coordination* in the global economy. After presenting the features of the GVC framework, I go on to focus in more detail on the newest and most dynamic form of GVC governance: value chain modularity.

Five Trends Driving the Pace of Global Integration

Global integration has a variety of indicators. First and foremost is a boom in international trade. For example, in 1985 the value of China's exports to the United States stood at about US$6.5 billion, less than one percent of total U.S. imports, and trade between the two countries was roughly balanced. In 2005 the United States had a trade deficit with China of more than US$185 billion, and China's share of total imports had increased to more than eleven percent. Intermediate goods trade is rising faster than final goods trade, a trend that indicates that increasing specialization and value chain fragmentation are key features of global integration (Yeats, 2001; Feenstra, 1998; Hummels et al., 2001). Another indicator of deepening integration in the global economy is rising anxiety about the loss of white-collar jobs in North America and Europe, triggered in part by India's dramatic and very recent successes in exporting software and business services (Sturgeon et al., 2006). Even in fresh food, patterns of production and trade are geographically extensive, complex, and dynamic. Fruit, vegetables, meat, and fish are grown and processed around the world and delivered daily to supermarket shelves in Europe and North America (Dolan and Humphrey, 2000, 2001).

These quick examples suggest that change in the global economy is broad-based, and is proceeding with great rapidity. What are the drivers? There are five trends that are combining with increasing trade liberalization to accelerate the pace of global integration:

1. *The "great doubling" of the global workforce.* The end of the cold war and abandonment of autarkic "import substituting" development policies in places like India, Russia, and China have quite suddenly increased the size of the global workforce from approximately 1.5 billion to 2.9 billion (Freeman, 2005). If the energy and talent of these workers can indeed be effectively tapped (see below), this increase could prove large and sudden enough to place downward pressure on wages in both advanced industrial economies such as the United States and Canada as well as developing places that have long been part of the global system such as Latin America and South East Asia.
2. *Lower costs and greater capacity in global communications networks.* The overbuilding of international data transmission networks during the "dot.com" boom, as well as aggressive efforts by countries such as India and China to improve their international links and domestic infrastructure, have contributed to a radical and sudden lowering of the costs of tapping the workers and industrial capabilities that reside in developing countries. This has improved access to the huge pools of low cost but adequately skilled labour that have recently become available in the global economy.
3. *The standardization, formalization, and digitization of work.* There has been broad application of information technology to a wide variety of work tasks and business processes (e.g., word processing, call routing, inventory management, factory production). Information technology facilitates both the fragmentation and relocation of work and the reintegration of those fragments once tasks are completed (Bardhan and Kroll, 2003; Berger at al, 2005). As more firms have adopted information technology it has become more standardized to facilitate system inter-operation and information sharing (Levy and Murnane, 2004). The encapsulation of work tasks into standardized modules (Baldwin and Clark, 2000) eases the movement of work because it reduces the need for exchanging tacit knowledge and the amount of training or new capital investment required. Such "modular-

ity" is now quite common in manufacturing, but advancements are proceeding with great speed in services, in part because of what has been learned in the realm of manufacturing (Gereffi et al., 2005; Berger et al., 2005).

4. *The new, global supply-base.* Standardization has also helped to create new business opportunities for 'global supplier' firms that pool capacity for a range of customers (see Sturgeon (2002) for examples from electronics manufacturing and Batt et al. (2005) for call centers). Some of these suppliers are located offshore (e.g., in India, Canada, and Ireland), and others have become global in scope, with facilities in both advanced and developing countries. Such global suppliers specialize in collecting work from other firms and moving it to its "optimal" location on the globe. They make it easier for medium-sized and even small firms to engage in global sourcing and to locate parts of their business offshore.
5. *The rise of the global start-up.* Because of the above four trends, it has become possible for start-up firms to set up global operations from the first day of operation (Breznitz, forthcoming). Venture capitalists, in fact, are encouraging this practice (Wilson, 2003; Mieszcowski, 2003; and Grimes, 2004). Not only does this raise the possibility that a larger share of employment creation from new firm and industry formation will occur offshore, it also raises questions about the continued innovative leadership in advanced economies, since parts of the innovation process itself are being moved to developing countries. In industries such as electronic hardware, for example, firms based in North America have been able to retain (and in some cases regain) control over the innovative trajectory of some product categories while moving high volume, labour-intensive, and price-sensitive segments of the value chain to low-cost geographical locations. The question is how sustainable this is, and if a similar pattern can or will emerge in industries that are just beginning to become globally integrated, such as services?

The pace of change has emerged as a critical factor in the recent debate over the effects of global integration on advanced economies (Bardhan and Kroll, 2003; Blinder, 2005). There are three basic positions regarding how deepening integrative trade will affect developed economies such as the United States and Canada. These are spelled out in very rough terms as follows: (1) Specialization and innovative leadership will continue to make developed economies rich, so no policy interventions will be required (Bhagwati, 2004). (2) Policy-makers only need to worry if developed economies hive off parts of industries in which they have comparative advantages, but these negative effects will likely be small, so all that policy should aim to do is to compensate losers (Samuelson, 2004). (3) It is entirely possible for developed economies to lose comparative advantages over time, so policy-makers should take steps in some instances to assist existing industries and bolster innovative capabilities (Gomory and Baumol, 2000).

All of these positions suggest that time is required for successful adjustment to global integration. Innovation and new market creation take time to occur, compensating losers is only possible if there are not too many coming on stream too quickly, and the erosion of established comparative advantages might be staunched through policy interventions as long as it happens gradually. If change occurs with extreme rapidity, it will be difficult to innovate fast enough, to compensate the flood of losers quickly enough, or to craft and implement effective policy measures in time to make a difference.

The debate over the newest feature of global integration, services offshoring, is a case in point. Dossani and Kenney (2004; 32) argue that, in the realm of services, low capital intensity and the purely electronic form in which many services can be delivered will drive global integration faster than has been the case in manufacturing. And because service occupations are widely distributed throughout the economy, the negative effects of services offshoring could be more broadly based than has been the case with the offshoring of manufacturing work (Bardhan and Kroll, 2003). It may be that the flow of work offshore will be sufficiently large and rapid to make adjustment extremely difficult. In this view, it is not that the theory of comparative advantage is wrong, but "…sometimes quantitative change is so large that it brings about qualitative change" (Blinder, 2005, p. 2).

The Importance of Qualitative Industry Case Studies

Because the stakes are so high, we must take global integration seriously and develop ways of thinking that place the new and emergent features of the global economy in the foreground. The venerable intellectual approaches to such questions focus on the roles of comparative advantage and transnational corporations in motivating and structuring international trade and investment. While these concepts have proved to be extremely robust and are still valuable, they do not emphasize the fragmentation of the value chain or the fluid, real-time integration of capabilities in advanced economies with capabilities in places that were all but outside of the global economy only two decades ago, such as China, India, Russia, and Vietnam. In fact, they emphasize the opposite: national export specialization in final products and the extension of national advantage, via multinational affiliates, to places without the domestic capabilities to effectively compete.

We should be concerned that the assumptions embedded in theories of comparative advantage may blind us to the truer nature of global integration: that industries are becoming globally distributed and are co-evolving in elaborate and ever shifting ecosystems that make it unclear where advantage truly lies. If we are to begin with a fresh sheet of paper, where should we start? One way is to move beyond aggregate statistics to work with microeconomic data ("micro-data") collected by government agencies. Over the past decade there has been a burgeoning body of research that relies on government-collected micro-data. Some of these resources have only recently become available.

There is a host of government programs that collect detailed economic data. Some of these programs, such as the Economic Census, use surveys to collect data for publication. Typically there are more detailed micro-data that underlie the published data. The mailing lists for these surveys can also contain valuable data on the basic characteristics of individual firms and establishments. Other programs collect data for the purpose of administering government programs such as tax collection, compliance with environmental protection laws, and the like. For this reason such data are typically referred to as "administrative data."

One example of how administrative micro-data have been made useful for researchers is the US Census Bureau's Business Register, which is essentially the sampling frame for the Economic Census. Data included are business name, address, a unique establishment-level identifier, industry, employment, and the identity of the firm that owns the enterprise. Data about ownership allow the enterprises in the Business Register to be aggregated to the firm level. Jarmin and Miranda (2002) have assembled the Business Register into a time-series for 1976-2002, referred to as the Longitudinal Business Database (LBD). The potential of the LBD has just begun to be tapped. For example, Bernard, Jensen, and Schott (2005b) link the LBD to the universe of import and export transactions for 1993-2000, revealing a detailed picture of the characteristics of firms that do and do not trade and offering a wealth of research possibilities on how US firms' trading activities and domestic operations are related.

Another example from the United States is the Longitudinal Research Database (LRD), which contains data on all manufacturing establishments that were in at least one US Census of Manufactures since 1963 or one annual survey of manufactures since 1972. For 1992, the LRD incorporated data for over 378,000 manufacturing establishments (in non-census years the total is about one-sixth that amount). The LRD contains data that identify individual establishments, and a high level of detail on the manufactured inputs and products (outputs) of those establishments. Identification data include permanent plant and establishment numbers, industry codes, location, current status, and legal form of organization. Input data include total employment, number of production workers, hours worked, labour costs, materials costs, materials consumed, services and energy consumed, inventory levels, depreciable assets, and capital expenditures. Product data include receipts (value of shipments, value added, value of re-sales); production details (5- or 7-digit SIC product codes, quantities of production, value and quantity of products shipped, value and quantity of interplant transfers, and internal consumption); and exports. Research using the LRD and other micro-data resources has explored a number of issues related to global integration, including establishment dynamics, job turnover, the effects of international trade, and productivity growth. While very valuable, these studies typically study the entire manufacturing sector and have not yet delved into the dynamics present in particular industries.

Researchers have also creatively used micro-data from more limited data sets to explore specific questions related to global integration. Harrison and McMillian (2006) and others have used the parent and foreign affiliate micro-data from the Bureau of Economic Analysis surveys on multinational firms to examine the relationship between affiliate activity and US employment. Swenson (2005) has examined the permanency of offshore assembly arrangements using extremely detailed data from United States International Trade Commission (USITC) reports. Kletzer (2002) has used micro-data from the Displaced Worker Survey to explore the experiences of workers displaced from manufacturing industries associated with increased foreign competition, and has made policy recommendations based on her findings. These studies are examples of leading-edge quantitative research on the employment effects of globalization. Because of the paucity of data collected on international trade in services, however, it is problematic to extend the methods used by these researchers to services.

But even micro-data are not enough. The rise in intermediate goods trade strongly suggests that we have moved beyond a situation where countries use domestic resources to develop and export products to the rest of the world. Countries and regions within countries are not responsible for making products and delivering services in their entirety, but have come to specialize in particular elements within the larger chain of value-added activities. As a result industrial output and export statistics provide a very partial view of where in the global economy value is created and where it is captured. Specifically, they provide very little, if any, insight into the critical questions of how much control firms and industries in specific places exert over the activities they and others carry out in the global economy and how this control is translated into the distribution of gains among firms, countries, and communities. Because the picture of global integration provided by trade and investment data is so incomplete, the causal links to welfare indicators such as employment and wages derived from macro statistics can be weak and unconvincing.

What is required is deep knowledge of the forces driving change in specific industries, occupations, and geographic locations. Even with better quantitative information coming from analysis of micro-data, the impact of global integration on advanced economies will be extremely difficult to fully comprehend or respond to without a detailed view of how global integration is intertwined with other aspects of economic change, especially the automation and computerization of work and the prevailing characteristics of labour markets and corporate strategies in specific service industries and occupations. The best way to learn about the interaction of these complex elements of economic change is though qualitative research on the trade-offs that managers of individual firms and establishments in specific industries face and the choices they make. Ralph Gomory has referred to industry studies of this kind as "observational science."[1]

Over the past 20 years, grounded, qualitative, field-based research on specific industries has led investigators to a common set of questions and concerns. As industry after industry has developed deep connections beyond local and national jurisdictions, the practitioners of such "industry studies" have gravitated toward questions about how the global-scale division of labour is evolving, what specific roles firms based in different societies play in global-scale production networks, and what the implications of these differences are for the welfare and economic performance of nations, workers, and communities, whose prospects and experiences are inherently more territorially bounded. In the 1960s through the 1980s, the multinational firm embodied the growing disjuncture between the motives of large firms and local communities. The concern was that the rise of "stateless" multinationals meant the demise of national industries and a loss of local control. But close observation shows us that even the largest firms remain rooted in their home economies in important ways even as their operations become global in scope. We are in the midst of a profound transition nonetheless. Multinational firms have arisen in many countries, resulting in a deep interpenetration of the global economy, driven by both outward and inward investment. But it is the expansion of non-equity ties, often referred to as 'global sourcing,' that generates the most novel and complex aspects of global integration.

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[1] Ralph Gomory is President of the Alfred P. Sloan Foundation. This comment was made in the course of remarks given at the Industry Studies Annual Conference in Cambridge, Massachusetts on Dec. 15, 2005.

Decisions about global sourcing and relocating business activities are inevitably made in the context of broader company strategies related to the development of new products, the pursuit of new customers and markets, the adoption of new technologies and production techniques, and the like. Distinguishing economic changes due to offshoring that displaces domestic employment from offshoring that does not—for example, when a firm establishes a presence to gain access to a foreign market that cannot be accessed through exports—is therefore extremely difficult to do without speaking directly with the managers making the key decisions. Even when examining the operations of a single firm, with full cooperation from management, it can be extremely difficult, if not impossible, to precisely measure the employment effects of global integration.

For example, Dossani and Kenney (2005), in their case study of Company X, an electronic equipment and services firm with approximately 30,000 employees worldwide, showed that the geographic consolidation of service-related activities in India was accompanied by simultaneous consolidation of business functions and information technology platforms (see Table 1). In the words of Rafiq Dossani:

Company X took the opportunity of preparing to outsource to India to completely re-engineer the way they did their back office work. In the process of doing this they created new job descriptions and new jobs in-house, new jobs for their local outsourcing partners, and new jobs for their offshore affiliates and partners. We tried to take a very granular view, to look at job descriptions, and follow where the work was being done, but found that this was impossible to do. So, even though we had an insider to work with and full cooperation, we were unable to actually look at job content and where that content was moved. For example, if a job consists of making an entry into a computer, and now it is made on a different platform, routed differently, supervised differently, it is not the same activity any longer.[2]

Table 1. The Context for Offshoring at Company X: Functional, Technological, and Geographic Consolidation

1) The consolidation of shared services across geographies and departments, particularly human resources, finance, engineering services and procurement, into a limited number of global hubs.
2) The consolidation of enterprise resource planning and customer relationship management [IT] systems into common platforms using off-the-shelf technologies and minimizing the usage of legacy applications.
3) The consolidation of geographical footprints.

Source: Dossani and Kenney, 2005, p. 25.

These methodological challenges should not lead us to abandon our efforts to gauge the employment effects of global integration, only to temper our confidence in estimates based on aggregate data or in the insights gained through qualitative research. Nevertheless, in specific industries and occupations, qualitative research can provide valuable insights into the real and potential job effects of global integration.

For example, Levy and Goelman (2005) use qualitative methods to show that only a tiny number of US radiology images are currently read outside of the United States; they convincingly argue that it is highly unlikely that this number will increase substantially in the future. The shift from analog to digital radiology imaging has certainly made the remote analysis of radiology images technically feasible, a fact that has spurred much hand wringing in the media about radiology jobs "moving" offshore. Tight labour markets and high salaries for radiologists, in part due to a cap on federal funding for hospital residencies, also suggest high potential for the offshore interpretation of radiology images. But because there is a need, in many cases, for close consultation between radiologist and doctors, almost all radiology images are read at or very near the site where they are taken. Moreover, the high cost of radiology imaging equipment relative to the cost of interpretation, the restriction of US malpractice insurance to doctors who have done US residencies and passed US medical board exams, the group power of US doctors to restrict competition, and Medicare reimbursement regulations all work to keep the remote interpretation of radiology images on shore.

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[2] Author interview with Rafiq Dossani, February 2, 2005, Stanford, CA.

Because of these "institutional" factors, Levy and Goelman found that virtually all of the very small number of radiology images that are read offshore are read by radiologists who completed their residency and passed their board certification in the United States. For example, a US board certified radiologist in Sydney, Australia, can work days reading images generated at night in the United States. An understanding of such industry-specific factors, and their interaction, requires deep knowledge of specific industries and occupations that can only be gained through qualitative research methods.

As these examples show, industry case studies have the potential to reveal some of the deeper dynamics, and limits, of global integration. One core finding from this research is that firms from advanced industrial countries have played a central role in driving and shaping global integration. In India, firms that provide IT services interact with clients from around the world on a daily or even hourly basis to provide them with the packages of services they need (Dossani and Kenney, 2003). In horticulture, large retailers have worked closely with exporting companies in Africa and Central America to obtain products that meet their ever-increasing demands for variety, food safety and speedy delivery (Dolan and Humphrey, 2001). In autos, advanced country suppliers such as Magna, Bosch, Lear, and Yazaki have set up global operations to support the network of final assembly plants that automakers have established to serve local markets (Sturgeon and Florida, 1999; Sutton, 2005). In electronics, lead firms such as Alcatel, Nortel, and Hewlett Packard have outsourced production to a set of huge, globally operating contract manufacturers including Celestica, Flextronics, Hon-hai, and Solectron (Sturgeon, 2002). In consumer goods and apparel, foreign companies do not merely buy what China produces and then resell it to North American consumers —Wal-Mart alone imported $15 billion worth of goods to North America from China in 2003—they actively shape the industrial transformation that has made the rise of China possible (Gereffi, 1994; Feenstra and Hamilton, 2006). The vast majority of exporting factories in Mainland China are run by firms from other economies such as Taiwan, Korea, Australia, Europe, Japan, and the United States; and most make products according to the detailed specifications set by non-Chinese firms such as Wal-Mart, Costco, Dell, and Nike. Clearly we need to look beyond trade and investment statistics to find out where the power in these global-scale production arrangements lie, and how these arrangements are changing.

Julia Lane of the National Science Foundation has likened the current state of qualitative industry research to the study of the natural world in the 16th and 17th centuries.[3] Curious researchers made detailed notes and drawings of what they could see of the vastness and variety around them, but there were few mechanisms for compiling the findings of individual researchers into larger pools of knowledge that could reveal broad patterns. Comparison of results came haphazardly with personal communication between scholars and in the few forums, such as the British Royal Society, where researchers could present and debate their results. In this way classification systems gradually came into being and some of the mechanisms at work in nature were revealed.

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[3] These remarks were made at the MIT Working Group on Services Offshoring Workshop, held in Cambridge, Massachusetts on October 28, 2005.

Similarly, industry researchers have now had several decades to present, publish, and debate their research results, and more effort is now shifting to the construction of classification systems and to a search for the mechanisms that work to create the variety observed in the field.

The findings show that global integration is expressed differently in different industries and places. The precise patterns and effects of global integration, therefore, depend in large part on the technical and business characteristics that prevail in specific industries, and upon social and institutional characteristics of the places in which the nodes of global industries are embedded. For example, some industries, or parts of industries, are easier to fragment and globalize than are others.

What is needed now is a generic theory to explain the different patterns and to predict the outcomes associated with them.

From Global Commodity Chains to Global Value Chains

A pioneering step toward the development of an industry-independent, firm-level theory of global governance was taken in a chapter that Gary Gereffi wrote for the 1994 book he edited with Miguel Korzeniewicz, *Commodity Chains and Global Capitalism*, entitled 'The Organization of Buyer-driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks.' Building on the work of Hopkins and Wallerstein (1977, 1986), who highlighted the power of the state in shaping global production systems, or 'global commodity chains' (GCCs), exercised in large part in the form of tariffs and local content rules at the point where goods and investment crossed borders, Gereffi broadened the focus of the GCC framework to include the strategies and actions of firms. Gereffi's framework laid out four key structures that characterize and shape GCCs (input-output, geographic, governance, and institutional) but one, governance, received the most attention, both from Gereffi and his immediate co-authors and from the many others that have made use of the GCC framework.[4]

One reason for the shift of focus to firm-level governance was the restricted ability of states to set tariffs and local content rules because of trade liberalization. However, Gereffi was one of the first scholars to argue convincingly that trade openness alone cannot explain the creation of industrial capabilities in developing countries. The best example of this is export-oriented industrialization in East Asia. It is commonly observed that the rapid growth of exports from developing countries has come with increased trade openness in the West. This is indeed a necessary condition for the export-oriented development that has been characteristic of the world's fastest growing economies, such as Taiwan, Korea, and China. But this development path has also been influenced and enabled by the competitive strategies of American, European, and Japanese firms, which established local operations, identified local firms as suppliers, transferred skills and technologies to them, invested in them, sold advanced equipment and services to them, and consistently ordered from them in a manner that pressured them to increase their industrial, technological, and logistical capabilities. As a result, developing countries, especially in East Asia, were able to establish and upgrade a critical set of domestic technological and industrial capabilities with great rapidity. Liberalization has enabled the growth of international trade, but without the push from advanced economy firms seeking to tap capabilities in developing countries, the cross-border flows of goods and services would surely be more modest, in terms of both total volume and technological content, than they are today. Because firms from advanced economies have done so much to create capabilities in developing countries, they continue to control and guide many of the key industrial resources in the global economy, even those that they do not own.

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[4] The first two structures mentioned by Gereffi, input-output and geographic, are largely descriptive. Firms, and the larger networks and industries to which they contribute, can be described as an amalgam of value-added activities. Through simple, if painstaking, observational research, each of these activities can be located, both organizationally and geographically, yielding the first two of Gereffi's four structures. Governance and institutional structures are causal of the first two, and so require theoretical explanation. Institutional influences on the organizational and geographic structures in global chains remain to be adequately theorized, though literature from the field of political science on varieties within capitalism provide some guidance at the level of national-level institutions (e.g., Hall and Soskice, 2001). But clearly, supra-national institutions, such as the trade rules set in the context of the World Trade Organization, can have strong effects on the geographic and organizational patterns observed in global chains.

Clearly, some firms exercise a greater degree control over the shape and extent of global production networks than others. The shift in focus was from the state to the actors in the chain, and their interrelationships, especially the relative power that "lead firms," the firms that place orders in global production networks, are able to exert to influence the actions of their affiliates and trading partners. Specifically, the GCC framework as adapted by Gereffi developed a key distinction between global chains that are "driven" by two kinds of lead firms: buyers and producers. The GCC framework usefully focused attention on the powerful role that large retailers, such as Wal-Mart, and highly successful branded merchandisers, such as Nike, have come to play in the governance of global production and distribution. Although "global buyers" typically own few, if any, of their own factories, the volume of their purchasing provides them with a huge amount of clout among their suppliers, power they have wielded to specify in great detail what, how, when, where, and by whom the goods they sell are produced. Extreme market power has also allowed global buyers to extract price concessions from their main suppliers. Supplier firms have responded by locating more of their factories in low-cost locations and working hard to extract price concessions from their own, upstream suppliers.

The GCC framework contrasted such "buyer-driven" chains with "producer-driven" chains, dominated by large manufacturing firms such as General Motors and IBM. Put simply, producer-driven chains have more linkages between affiliates of multinational firms, while buyer-driven chains have more linkages between legally independent firms. Underlying this distinction is the notion that buyer-driven chains turned out relatively simple products, such as apparel, house wares, and toys. Because innovation lies more in product design and marketing rather than in manufacturing know-how, it was relatively easy for lead firms to outsource production. In the more technology- and capital-intensive items made in producer-driven chains, such as autos and complex electronics, technology and production expertise were core competencies that needed to be developed and deployed in-house, or in tightly affiliated "captive" suppliers that could be blocked from sharing them with competitors.

Since Gereffi's seminal work was published in 1994, transnational giants have changed quite dramatically, outsourcing many activities and developing strategic alliances with competitors. In short, they have become less vertically integrated and more network-oriented. Better global standards in the realms of business processes and product characteristics, and the heavy application of information technology in areas such as design, manufacturing, service provision, supply-chain coordination, and materials management, have enabled increased outsourcing in producer-driven chains and made it possible, and more compelling, for firms to use these systems to streamline the linkages between buyers and suppliers in both producer- and buyer-driven chains. The result has been broad and rapid shifts in chain governance, where producers have become more buyer-like through outsourcing, and where the capabilities required to serve global buyers have been escalating rapidly. Today, global-scale networks of legally independent firms no longer make only simple items, but technology- and capital-intensive goods and services as well.

Because of these changes, there was a need to move beyond the GCC framework. Field research in a range of global industries revealed convergence in global value chain structure toward external networks, but not all of these industries were labour intensive, and this demanded more network types than buyer-driven. Specifically, there are four new features in the governance of global-scale production networks that stimulated us to reconceptualize the key variables in global chain governance:

- Improvements in information technology and industry-level standards were enabling the codification of complex information, which in turn was easing the way for network forms of organization in technology-intensive industries.
- Flexible capital equipment was enabling the pooling of technology- and capital-intensive production in the same way that labour-intensive production could be pooled, again easing the way for network forms of organization in technology-intensive industries.
- Sophisticated supply-chain management tools were pushing labour-intensive industries up the technology curve.
- Increased outsourcing by manufacturing firms, and increased involvement in product definition by retailers (private label) were blurring the distinction between buyers and producers.

So work began to develop a new theory for understanding, explaining, and predicting firm-level governance patterns in the global economy. The result was the Global Value Chains (GVC) framework, developed by a network of scholars, practitioners, policy-makers, and NGO activists over a period of several years.[5] The central questions we asked were: How are specific industries coordinated at a global scale? What are the key variables that contribute to these governance patterns? What patterns of global value chain governance can be expected when these variables change? It is our attempt to answer this last question that set the GVC framework apart. Instead of a static typology, we sought to develop an operational conceptual model. In other words, changing the value of the variables should yield distinct and predictable patterns of global value chain governance.

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[5] See http://www.globalvaluechains.org for a summary of the GVC Initiative as well as a list of related researchers and publications.

To sum up, the GCC framework was extremely valuable because it shed light on the new and powerful role that retailers and branded merchandisers were playing in global production networks. But the producer/buyer-driven typology was static. It provided no mechanisms to account for shifts in barriers to network entry brought on by technological change or firm- and industry-level learning. As empirical changes forced us to take a more dynamic view of the governance patterns in global production network, two things became clear:

1) there was a convergence of chain governance away from the producer-driven variant toward external, non-equity networks, and
2) the buyer-driven type could not characterize all of the network types being observed in the field.

The Global Value Chains Framework

The GVC framework was first published in an article entitled 'The Governance of Global Value Chains' in the journal *Review of International Political Economy* (Gereffi, Humphrey, and Sturgeon, 2005). The article sought to both account for the recent observed changes in the organization of the global economy and to build a more theoretically-grounded approach to explaining and predicting firm-level governance patterns in geographically separate economic activities. As such, we were consciously extending and refining the GCC framework.

The GVC framework is a tool kit for understanding how activities are linked across great distances in the global economy. The main object of inquiry is the nature and content of the link between value-added activities. For simplicity's sake, we began with two kinds of firms, lead firms, or order makers, and suppliers, or order takers. Much of the literature that seeks to create governance categories by examining the linkages between buyers and sellers in the global (or local) economy identify only two options: market or hierarchy (Williamson, 1975). Firms either invest offshore directly or buy goods and services from foreign firms. A smaller body of literature has noted the prevalence of network forms of organization where there is some form of "explicit coordination" beyond simple market transactions but which fall short of vertical integration (Powell, 1990; Adler, 2001). While the insights from this "network" literature are useful, our field research convinced us that not all networks are the same. We identified four kinds of transactional linkages between lead firms and suppliers, market, modular, relational, and captive, and summarized all manner of intra-firm linkages as hierarchical. This yields five types of linkages, which, assuming that all linkages in a given chain of activities are governed similarly, aggregate into five ideal types of GVC governance.[6] In essence, the GVC framework specifies three types of network governance (modular, relational, and captive) along with the two traditional modes of economic governance (markets and hierarchies). The characteristics of the five GVC governance types are summarized in Table 2.

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[6] Obviously, in the real world, a given value chain will display a mix of governance forms. To complicate matters further, in-house linkages can also take a variety of forms.

Table 2. Five Forms of Global Value Chain Governance

1. *Markets.* Markets are the simplest form of GVC governance. GVCs governed by markets contain firms and individuals with little interaction beyond exchanging goods and services for money. The central governance mechanism is price. The linkages between value chain activities are not very "thick" because the information that needs to be exchanged and knowledge that needs to be shared are relatively straightforward.

2. *Modular value chains.* This is the most market-like of the three network-style GVC governance patterns. Typically, suppliers in modular value chains make products or provide services to a customer's specifications. Suppliers in modular value chains tend to take full responsibility for process technology and often use generic machinery that spreads investments across a wide customer base. This keeps switching costs low and limits transaction-specific investments, even though buyer-supplier interactions can be very complex. Linkages are necessarily thicker than in simple markets because of the high volume of information flowing across the inter-firm link, but at the same time codification schemes and the internalization of coherent realms of knowledge in value chain "modules," such as design or production, can keep interactions between value chain partners from becoming highly dense and idiosyncratic.

3. *Relational value chains.* In this network-style GVC governance pattern we see mutual dependence regulated through reputation, social and spatial proximity, family and ethnic ties, and the like. The most obvious examples of such networks are in specific communities, or "industrial districts," but trust and reputational effects can operate in spatially dispersed networks as well. Since trust and mutual dependence in relational GVCs take a long time to build up, and since the effects of spatial and social proximity are, by definition, limited to a relatively small set of co-located firms, the costs of switching to new partners tends to be high. Dense interactions and knowledge sharing are supported by the deep understanding value chain partners have of one another, but unlike the codification schemes that enable modular networks, these "short-cuts" tend to be idiosyncratic and thus difficult and time-consuming to re-establish with new value chain partners.

4. *Captive value chains.* In this network-style GVC governance pattern, small suppliers tend to be dependent on larger, dominant buyers. Depending on a dominant lead firm raises switching costs for suppliers, which are "captive." Such networks are frequently characterized by a high degree of monitoring and control by the lead firm. The asymmetric power relationships in captive networks force suppliers to link to their customer in ways that are specified by, and often specific to a particular customer, leading to thick, idiosyncratic linkages and high switching costs all round.

5. *Hierarchy.* This governance pattern is characterized by vertical integration (i.e., "transactions" take place inside a single firm). The dominant form of governance is managerial control.

6. The *exclusion of suppliers* from the chain. If there is low complexity and a high possibility for codification, and suppliers still do not have the capabilities to meet the requirements of buyers, then it is likely that they will be excluded from the chain. While this does not generate a global value chain type, *per se*, it is a situation that is quite common, and with requirements for suppliers increasing, perhaps increasingly likely to occur (Sturgeon and Lester, 2004).[7]

When would we expect each of these five governance forms to occur? From our field research, reading, and discussions, we have identified three key variables:

1) the *complexity* of the information exchange required to complete the transaction;
2) the degree to which the information can be expressed formally, or its *codifiability*; and
3) the level of competence in the supplier relative to the transaction.

The three variables are summarized in Table 3.

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[7] It is the exclusion of developing country suppliers that has motivated us, more than any other factor, to construct this theory of global value chains. If the framework can help to make sense of value chain governance patterns, then it can be used as a basis for the development of more effective policies for industrial upgrading, especially those aimed at rectifying situations of supplier exclusion.

Table 3. Three Key Variables in Global Value Chain Governance

1. *The complexity of transactions*. More complex transactions require greater interaction among actors in GVCs and thus stronger forms of governance than simple price-based markets. Thus, complex transactions will likely to be associated with one of the three network governance patterns (modular, relational, or captive) or integrated within a single firm (hierarchy).

2. *The codifiability of transactions*. In some industries schemes have been worked out to codify complex information in a manner in which data can be handed off between GVC partners with relative ease, often using advanced information technologies. If suppliers have the competence to receive and act upon such codified information, and if the codification schemes are widely known and widely used, then we would expect to see modular value chains emerge. If not, then lead firms might either keep the function in-house, leading to more vertical integration (hierarchy) or outsource it to a supplier that they tightly control and monitor (the captive network type) or have a dense, idiosyncratic relationship with suppliers (the relational governance type).

3. *The competence of suppliers*. The ability to receive and act upon complex information or instructions from lead firms requires a high degree of competence on the part of suppliers. Only then can the transfer of complex but codified information be achieved (as in modular networks) or intense interaction be worthwhile (as in relational networks). Where competent suppliers do not exist, lead firms either must internalize the function (hierarchy) or outsource it to suppliers that they tightly monitor and control (captive suppliers).

Furthermore, if one of these three variables changes, then value chain governance patterns tend to change in predictable ways. For example, if a new technology renders an established codification scheme obsolete, we would expect, all other thing being equal, modular value chains to become more relational, and if competent suppliers cannot be found, then captive networks and even vertical integration would become more prevalent. Conversely, rising supplier competence would tend to push captive governance more toward the relational type and better codification schemes might prepare the ground for modular governance. The five global value chain governance types, along with the values of the three variables that determine them, are shown in Figure 1. The five types of global value chain governance are derived from ascribing binary (high or low) values to the three key variables: 1) complexity of inter-firm transactions; 2) the degree to which this complexity can be mitigated through codification; and 3) the extent to which suppliers have the necessary capabilities to meet the buyers' requirements. Each governance type provides a different trade-off between the benefits and risks of outsourcing. As shown in the last column of Figure 1, the governance types comprise a spectrum running from low levels of explicit coordination and power asymmetry between buyers and suppliers, in the case of markets, to high levels of explicit coordination and power asymmetry between buyers and suppliers, in the case of hierarchy.

Figure 1. The Global Value Chains Framework

	Key Variable			
Governance Type	*Complexity of transactions*	*Ability to codify transactions*	*Capabilities in the supply base*	*Degree of explicit coordination and power asymmetry*
Market	Low	High	High	*Low*
Modular	High	High	High	
Relational	High	Low	High	↕
Captive	High	High	Low	
Hierarchy	High	Low	Low	*High*

Note: There are eight possible combinations of the three variables. Five of them generate global value chain types. The combination of low complexity of transactions and low ability to codify is unlikely to occur. This excludes two combinations. If the complexity of the transaction is low and the ability to codify is high, then low supplier capability would lead to exclusion from the value chain. While this is an important outcome, it does not generate a governance type *per se*.

The theory of GVC governance presented here combines key insights from a variety of disciplines. First, from institutional economics we accept the importance of asset specificity as a key problem in inter-firm relationships (Williamson 1985). Firms that have assets that are specific to a single trading partner create risks of hold-up that must somehow be solved. Institutional economics offers vertical integration as the solution, yielding the markets and hierarchies dichotomy. While we agree that vertical integration is one way to solve the problem of asset specificity, literatures from several other fields convince us that there are other solutions. From the economic, sociology and economic geography literatures we learn that trust and reputation, built up over time through repeat transactions and enabled by social and spatial proximity, can offset the risks of asset specificity without vertical integration (Piore and Sabel, 1984; Granovetter, 1985; Storper, 1995). The resource view of the firm prevalent in the management literature (Penrose, 1959) convinces us that some business functions can be very difficult to acquire or to develop in-house, and so firms must continue to source them externally even if asset specificity is present. Finally, from concepts such as "open innovation," "platform management," and "modularity" developed in recent literature from the field of business history we learn that firms can engineer their way out of problems of asset specificity by standardizing and codifying information at specific "pinch points" in the chain of value added activities (Baldwin and Clark, 2000; Chesbrough and Kusunoki, 2001; Gawer and Cusumano, 2002).

The GVC framework is not intended to provide a grand theory of economic development, or even a full theory of the forces that shape global integration, but a transaction-, firm- and industry-centric theory of governance among the firm- and establishment-level actors in the chain. As such it cannot provide a full accounting of the governance characteristics of global value chains. It can, however, provide a bottom-up, research-driven method for accounting for observed global value chain governance characteristics as well as those that are predicted to arise *absent other factors and influences*. In this way, the GVC framework can provide researchers and policy-makers with a useful and relatively simple first-cut: if the value chain governance patterns that are predicted by the theory are not observed empirically, this provides a strong indication that forces external to the chain, such as national institutions or international trade rules, are playing a large role. In this way, the framework can provide insight into, but not a full accounting for, the observed features of global integration. While implications for policy are numerous, they depend wholly on context, and I will not attempt to fully elaborate them here. To provide just one example, relational value chains, or more accurately the relational segments of value chains, tend to be less geographically mobile, not only because they require frequent interaction to develop and exchange tacit knowledge, but because they are often governed by the shared expectations of trust and reputation developed over long periods of time.

Modularity in Global Value Chains

Of all the governance forms generated by the global value chains framework, modular value chains are the most novel because they are enabled by very recent advancements in information technology, robust industry standards, and global-scale data communications systems. They also warrant our attention because they are extremely fluid organizationally and geographically and so readily allow the production of complex goods and services to be fragmented and geographically dispersed. Finally, modular value chains, because they are based on the exchange of information according to well known standards, are very fluid relative to other forms of GVC governance that require more time to establish and re-establish efficient inter-firm linkages. This fluidity, in terms of where specific value chain activities are carried out and by whom, has contributed to the acceleration of global integration mentioned earlier. Because the rise of value chain modularity has obvious implications for policy, it is worth examining its features and precursors in some detail.

Value chain modularity is based on functional specialization, formalization of value chain linkages, and an increase in the scale and geographic reach of each horizontal segment—or 'module'—of the value chain (Baldwin and Clark, 2000; Sturgeon, 2002; Takaishi and Fujimoto, 2001; Langlois, 2003; Prencipe et al., 2003; Gereffi et al., 2005; Sturgeon and Lee, 2005). In modular value chains distinct breaks in the sequence of activities tend to form at points where information regarding product and process specifications can be highly formalized. Activities tend to remain tightly integrated and based on tacit linkages within functionally specialized nodes of "relational" activity. Within these relational nodes tacit knowledge is created, exchanged, and processed by establishments and workers who tend to be co-located. Between these nodes, however, linkages are eased by the application of widely agreed-upon protocols and standards. Codified linkages allow value chain modules to more easily be located at great distance.

Codification and standardization have helped to create simplified and reliable methods for transmitting detailed product and production specifications along the value chain, and for keeping track of large, complex projects with participants in diverse locations and organizations. As Coase (1937) perceived, this sort of formalization of information at the inter-firm link lowers transaction costs, allowing firms to more easily purchase inputs on the market. However, the content of this information exchange, as Coase envisioned it, consisted largely of price data. The high volume of non-price data flowing across the inter-firm link differentiates modular value chains from simple markets. Because of this complexity it is not unusual that additional engineering and coordination is required to complete a transaction. The hand-off of product and process specifications between firms need not be perfectly clean, but only relatively so for modular value chains to function.

Specifically, the key business processes that have been formalized, codified, standardized, and computerized are product design (e.g., computer aided design), production planning and inventory and logistic control (e.g., enterprise resource planning), as well as various aspects of the production process itself (e.g., assembly, test and inspection, material handling). Furthermore, because it is "platform independent," the Internet has provided an ideal vehicle for sharing and monitoring the data generated and used by these systems. Such technologies and practices are at the core of value chain modularity. It is the formalization of information and knowledge at the inter-firm link, and the relative independence of the participating firms that gives value chain modularity its essential character: flexibility, resilience, speed, and economies of scale that accrue at the level of the industry rather than the firm (Sturgeon and Lee, 2005). Modular linkages between relational nodes of tacit activity can exist within a single firm, but only when activities are outsourced can scale economies build up beyond the level of the firm (Langlois and Robertson, 1995).

Value chain modularity introduces risks as well as benefits for participating firms. Responsiveness may suffer as contracts are hammered out. There is potential for intellectual property and other sensitive information about product features, pricing, production forecasts, and customers to leak to competitors through shared suppliers. The ability of lead firms to innovate and design successive product generations may suffer from the atrophying of manufacturing and component knowledge, a problem that has been referred to by Chesbrough and Kusunoki (2001) as the 'modularity trap.' Reliance on standard interfaces may lead to the use of standard components, leading in turn to a loss of product distinctiveness. Shared and overlapping inventory resident in supplier organizations can lead to distortions and tracking problems that introduce waste. One unavoidable issue is that independent firms in buyer-supplier relationships often have competing interests.

In the American electronics industry, value chain modularity took shape during the late 1980s and early 1990s. Because many established firms had in-house manufacturing and components divisions, this change required the break-up of vertically integrated corporate structures and the aggregation of cast off activities in suppliers. Hewlett Packard and IBM led the way, selling most of their worldwide manufacturing infrastructure to contract manufacturers such as Solectron and Flextronics, or spinning off internal divisions as merchant contract manufacturers, as IBM did with its Toronto manufacturing complex in 1997, creating the contract manufacturer Celestica. Another source of growth in contract manufacturing was increased business from newer firms that never built up internal manufacturing divisions, such as the Internet switch company Cisco and the computer workstation and server firms Sun Microsystems and Silicon Graphics (Sturgeon, 2002).

Outsourced circuit board and final assembly of commercial electronics (products for the medical, automotive, communications, military, corporate computing markets) was mostly transferred to contract manufacturers based in North America, specifically the big five 'electronics manufacturing services' (EMS) firms Flextronics, Solectron, Sanmina-SCI, Jabil, and Celestica, while the assembly and even some of the design of notebook and desktop personal computers were outsourced to 'original equipment' and 'original design' (OEM and ODM) contract manufacturers based in Taiwan, such as Quanta, Compal, Inventec, Hon Hai (Foxconn), and Wistron, the contract design and manufacturing arm of Acer. By the end of the 1990s, much of the manufacturing capacity of the Taiwan-based contract manufacturers had shifted to mainland China, and the big five United States-based contract manufacturers had established a global-scale network of factories (Sturgeon and Lester, 2004). At the level of components, the 1990s was a time of rapid growth among 'fabless' semiconductor design firms and the semiconductor foundries (chip manufacturing plants) that served them, such as the Taiwan-based TSMC and UMC, as well as IBM (Linden and Samaya, 2003). By the end of the 1990s, modular value chains in the electronics industry were highly developed and global in scope.

An important aspect of global integration, then, is the globalization of the supply-base. As more work has been handed off to independent suppliers and service providers that are tied to lead firms though modular value chain linkages, two things have happened. First, the largest suppliers have achieved unprecedented economies of scale and scope by pooling resources across a broad customer base. As a result, some have increased the geographic scope of their business to the point where they have global-scale operations. So the multinational firm continues to be a powerful force regardless of the fragmentation and re-bundling in the value chain. Second, the existence of highly competent independent local and global suppliers has lowered the barriers to globalization for firms, including small and medium-sized firms, which have not yet shifted any activities offshore. When smaller, less competent firms begin to look outside of their own companies and perhaps even offshore for key inputs, markets are created for a broader array of functions to be outsourced, and this drives suppliers to bundle additional functions and further increase their range of competencies.

Conclusions

Integrative trade is being driven by vertical fragmentation, where firms specialize in providing specific bundles of goods and services to a larger network of firms. This bundling and packaging of functions by suppliers lowers barriers to global sourcing yet further, setting in motion a cycle of increased supply-base competence and increased outsourcing and offshoring of which we clearly have not seen the end. The "co-evolutionary" view of global-scale economic integration (Sturgeon and Lee, 2005) that is embedded in the GVC framework emphasizes that the patterns of globalization that have already developed work to alter future patterns. For example, we must consider the possibility that the pace of globalization observed in manufacturing industries since the 1970s will be a poor indicator of what is likely to happen in services. The offshoring of computer hardware production began at a time when the firms in societies receiving this new business had few capabilities. International communications systems were slow, unreliable, of limited functionality, and very costly to use. Services offshoring, by contrast, is expanding with the infrastructure, firm capabilities, and business models that have been established, tested, and refined in support of global manufacturing already in place. Integrative trade in services, then, will flow down the well-trodden avenues in the global economy that were put in place largely to support global-scale goods production: across highly functional and low-cost broadband communications systems, through cross-border business relationships that have now been in place for decades, according to business models regarding outsourcing and offshoring that have been worked out in exquisite detail, and through firms with huge, well established multinational operations. Looking to the future, we cannot and should not pretend to know precisely how much or what kind of economic activity will flow across these pathways, but we cannot afford to be complacent. The long-term prospects for any country may be less certain given the vastly altered playing field on which global integration is unfolding.

The lessons for research and policy are numerous. New thinking is needed to develop useful insights into the character and implications of our increasingly globally integrated national economies. Long cherished notions and responses may need to be set aside, to be replaced or at least supplemented with new theoretical frameworks and policy initiatives. Perhaps the most pressing need is for new kinds of data to be collected, data that shed light on the important questions of power and coordination within global value chains.

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Data Issues on Integrative Trade between Canada and the US

Measurement Issues for Supply Chains

Art Ridgeway *

Introduction

Reduced barriers to the flow of capital, goods, and services, combined with rapid advances in communication and transportation technology, have for many years been fostering increased specialization of production activity, and this trend continues. The same factors have also led large firms, particularly multinational firms, to reorganize how they manage their operations. Firms are increasingly focusing on supply chain management and the choice between make or buy for intermediate inputs and, increasingly, service inputs. Within the make-buy decision are decisions on the location of supply, domestic or international.

These factors have also encouraged the development or emergence of a number of economies that are now growing rapidly by providing lower cost alternatives for many production activities. This includes the so-called BRIC countries (Brazil, Russia, India, and China) and the eastern European economies. For example, China is now the second largest source of Canadian merchandise imports and Brazil is now one of Canada's top ten partner countries in both inward and outward foreign direct investment.

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The organization of some multinational enterprises now exhibits a separation of the management of operations and the legal structure of the enterprise. Operations can be managed in units that cross multiple countries, while there are, necessarily, separate legal structures for each country. While this dual structure allows the enterprise to efficiently manage its operations and respond to regulatory and fiscal requirements, neither structure conforms to that required to produce economic data in support of policy. In addition, these structures increase the importance of intra-firm transactions where transfer pricing may be an issue.

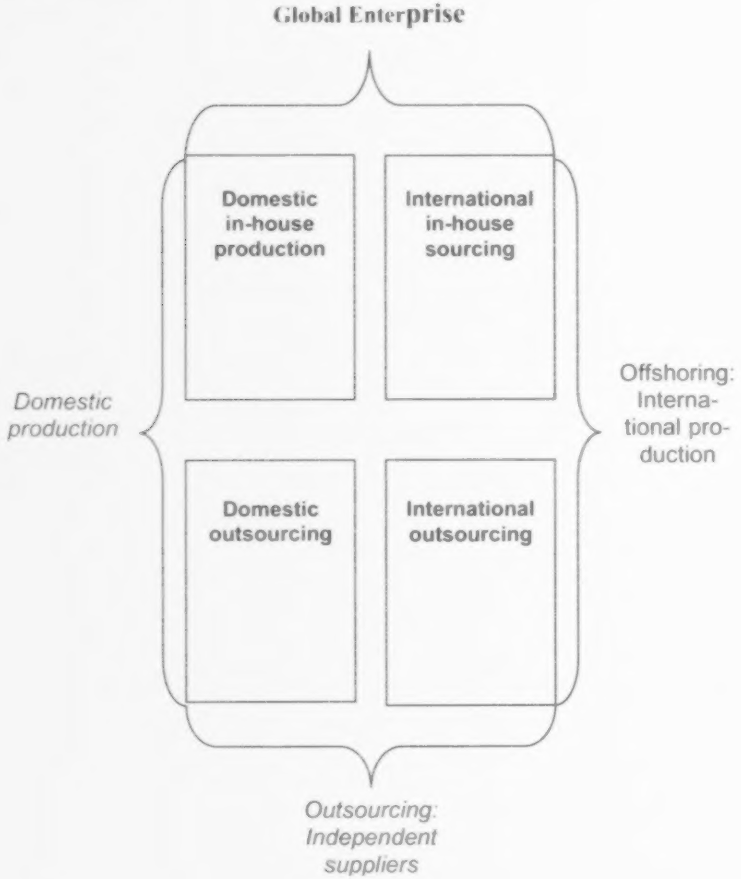
A recent international study by a group of national statistical agencies that attempted to coordinate the collection of data for a sample of multinational enterprises revealed that these multinational enterprises are very sensitive about the confidentiality of their data. They were quite concerned with efforts to reconcile across countries how they reported to the participating statistical agencies.

This paper looks at some of the implications of the globalization trend for economic statistics particularly with respect to the fragmentation of the production process and international trade. The annex provides a brief description of a range of statistical programs and current initiatives at Statistics Canada that are aimed at shedding light on the ongoing trend of globalization of production around the world economy.

Implications of Globalization Trends for Economic Statistics

These ongoing changes have led to the demand for new measures of economic activity and have affected how some traditional data series are gathered and interpreted. The drivers of the growth in globalization have been innovation and changing business structures and practices. Data on research and development activities have been available for many years, but more recently there have been demands for a broader set of data on innovation and the commercialization of new knowledge, and on the use of new electronic and other business practices. Statistics Canada's science, innovation, and electronic information program continues to evolve in response to these new demands. In addition, there have been recent demands to directly measure the globalizing structural changes that are occurring. Offshoring is a phenomenon that users are seeking information on but that is not easily measured. Diagram 1 below presents a simple illustration of the relationship between the global enterprise, domestic production, outsourcing and offshoring.

Diagram 1: Global enterprises, production, outsourcing and offshoring


Global Enterprise
Domestic in-house production
International in-house sourcing
Domestic production
Offshoring: International production
Domestic outsourcing
International outsourcing
Outsourcing: Independent suppliers

This diagram illustrates the broadest concepts of outsourcing and offshoring. Some analysts use these terms in a more restricted sense, defining them to refer just to those activities that have moved out of in-house or domestic production to independent or international production. Measuring outsourcing or offshoring events as defined by the narrow definition is very demanding, as this involves identifying decisions made at a specific point in time.

However, the most profound implications of increasing globalization may be in the challenges of measuring some of the core economic indicators. Moving productive activity out of the top left hand corner of the diagram to any of the three other quadrants implies that the ratio of gross flows to value added will increase. Factors that are increasing the measurement challenges include:

- the increasing value of service flows
- the increasing importance of flows internal to the global enterprise
- the increasing proportion of physical flows that are not coincident with changes in ownership

It used to be the case that when goods crossed borders they almost always changed ownership. This is no longer true. This separation of the ownership of goods and the cross-border flows in a multiple step production process is causing major valuation challenges. While there have been occasional instances of this for some time, the separation of ownership and production flows seems to be increasing. Collecting data from legal structures will generally reflect the ownership of resources whereas collection from operating units is more likely to reflect the operational flows of resources. While both are important for the full articulation of the economic data system, the reconciliation of data from the two separate structures is becoming more difficult.

These challenges and the growing demand for new policy relevant data come at a time of declining response rates for many business surveys. Fortunately, the increased use of administrative data for 'simple' businesses has greatly reduced the burden for the small and medium end of the population, while allowing an improved coverage of these units. However, there are a few hundred of the largest enterprises in the country that account for a very large part of economic activity, and the deterioration in their rates of response to surveys is a concern. While declining response to surveys is not uniquely related to globalization per se, the fact that the non-respondents are often large globally oriented firms makes it difficult to get the data needed to measure globalization.

In addition, the growing importance of the emerging economies in Asia and South America pose challenges for bilateral comparisons as most of these countries have less well-developed statistical systems. Bilateral comparisons of data show large differences but, given the state of development of these statistical systems, it is difficult to assess the reasons for the discrepancies.

International Efforts

International organizations have been active in expanding the conceptual basis for measuring activity related to globalization. The OECD Technological Balance of Payments Manual has been in use since its release in 1990. More recently, the OECD has provided the OECD Handbook on Economic Globalisation Indicators and the related publication, Measuring Globalization: OECD Economic Globalisation Indicators.

Other statistical manuals currently under revision will provide improved links to the new measures of globalization. In particular, the SNA manual[1], the BOP manual[2], and the OECD Benchmark Definition of Foreign Direct Investment will have additional material on globalization. It has been announced recently that the manual on Statistics of International Trade in Services will also be updated to harmonize with the new material in the core manuals, including that on globalization. Statistics Canada has played a key role in all of these international developments.

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[1] For additional information on the updating of SNA 93 see United Nations National Accounts Section, Towards 1993 SNA Rev.1 http://unstats.un.org/unsd/nationalaccount/snarev1.asp

[2] Additional information on the revision of the BOP Manual see Revision of the Fifth Edition of the IMF's Balance of Payments Manual http://www.imf.org/external/np/sta/bop/bopman5.htm

Two of the most hotly debated issues addressed during the revision process concern the issue raised earlier where physical flows and ownership change are not coincident. The two issues are referred to as goods for processing and merchanting. The first deals with cases where goods enter a country for processing but the ownership is not transferred to a domestic producer. In merchanting a merchant buys goods, taking ownership, and sells them to a third party, but the goods never enter the merchant's country.

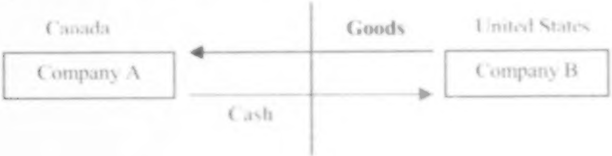
The Canadian response to these challenges is being developed as part of an overall plan to move the Canadian economic statistics program in line with the revised international manuals mentioned above.

Goods Trade in a Simple World

Goods dominate international trade. To start the exploration of measurement issues, take the simple case of the export of goods across the Canada–US border. There are two firms, one in Canada the other in the US, and one wishes to buy what the other produces. They agree on a contract, specifying the conditions of sale, and in due course the goods arrive at the customs frontier on the way from the seller to the buyer.

In this simple case depicted in Diagram 2 the exporter and the importer of record are the buyer and seller, and the customs documentation would show the flow of goods from one to the other. At the same time, or at least within a short period before or after the shipment, there would be funds transferred from the bank account of the buyer to the bank account of the seller.

Diagram 2: Traditional View of Goods Trade



It is a basic tenet of economic statistics such as the national accounts and the balance of payments that transactions should be based on exchanges of economic ownership[3]. In this simple case the goods go from B to A and the money goes from A to B. Since the exact timing of the ownership change between A and B can vary depending on the contract and the payment agreement, as a proxy for change of ownership, economic statistics use the crossing of the customs frontier as the point at which the goods change ownership. It is assumed that this is a good proxy for the change of ownership.

It might be noted that there is no information here on what A is going to do with these goods from B. In the case of Canada and the US we know that often these goods will be used as intermediate inputs in other goods that in turn will go back across the border to the US.

In this simple case, if the industrial activity of each of A and B is known and the location of their business is known, one can build up trade data showing to/from information on a geographic and an industry basis.

The real world, of course, has never been quite that simple, as often transactions are handled via brokers who may affect the timing of certain transactions or at least the recording of transactions. In addition, the timing of payment may vary more widely, and so a debt may be recognized between the supplier and the buyer, which is eliminated as the goods are paid for or delivered if prepaid.

The simple fact of inserting a broker can already cloud the analysis of the data as the customs documentation may well show the industry and location of the broker as one of the transactors and the capacity to undertake industry and geographic analysis is weakened.

The buyers and sellers may be owned by the same owner and thus part of a multinational enterprise. The ownership link is likely to affect the stability of the commercial relationship, but it may also affect the prices of the transactions that are recorded.

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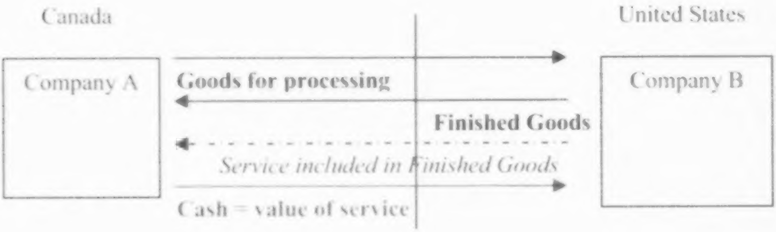
[3] The term economic ownership is used to differentiate it from legal ownership, which is generally the same but can differ in cases such as financial leases.

Goods for Processing

The first deviation from this simple model to be explored in this paper is that of goods for processing. As noted earlier, this is not a new phenomenon as examples have existed for decades but there is evidence that the volume of goods traded under this scenario is growing rapidly.

The basic change in the model here is that the goods do not change ownership as they cross the border but the contract between A and B now stipulates that the goods are to remain the property of A but that B will perform some specified processing of the goods and then send them back to A. This type of processing may be between enterprises under common ownership or enterprises operating at arms length. A will pay B a service fee for this processing.

Diagram 3: Goods for Processing – Current Treatment



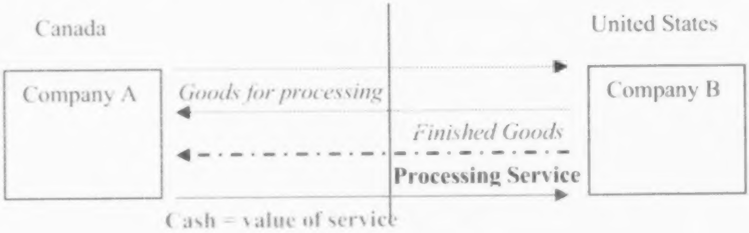
In this scenario the customs process records these goods but they are generally not distinguishable from other goods crossing the border. There must also be a value declared for these goods. However, the counterpart financial transaction between A and B will be greatly different than if ownership had actually changed as the goods moved between them. In this case only the value of the service will flow from A to B, which will correspond approximately to the net difference between the values declared to customs for the import and the export.

The current treatment of these situations in the economic accounts is to record these goods as if they had changed ownership as they cross the border. The full value of the goods is entered into the trade data in both directions and corresponding financial flows are recorded. The service provided by the processor is buried in the value of the returning goods.

This treatment corresponds well to the construction of supply and use tables such as the Canadian I-O Accounts but does not shed light on the evolving behaviour of business activity and is not in keeping with actual financial flows.

During the recent international efforts to update the conceptual guidance for the System of National Accounts and the Balance of Payments, it has been decided that the guidance on these types of transactions will be changed to correspond to the ownership principle. While the goods flowing both ways will continue to be included in the customs data, the convention will be to remove these values from the Balance-of-Payments-based trade data used in the BOP and SNA. Instead the service flow and corresponding payment will be reflected in the accounts.

Diagram 4: Goods for Processing – New International Convention (SNA & BOP)

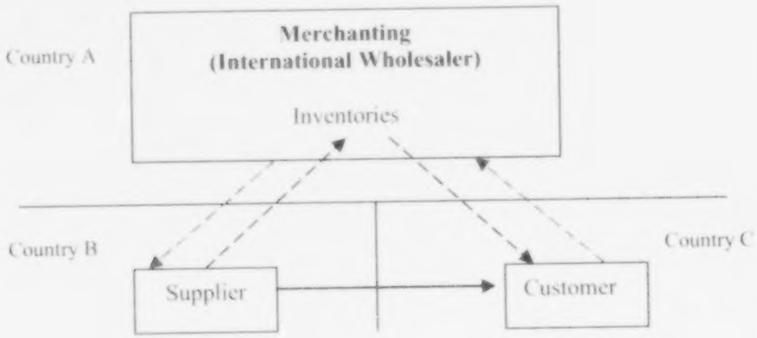


This would require that there be data to differentiate these cross-border flows of goods from traditional transactions. The customs data do not as yet provide such information. The service flows will have to be measured using surveys as there are no administrative sources for these data.

Merchanting

The new world of production can also have instances of what is referred to in the statistical manuals as "merchanting." Other terms might be international trading or international wholesaling. This is the case where an enterprise in country A buys goods in country B but the goods never enter country A but are sold on to country C.

Diagram 5: Merchanting – International Convention



While the ownership of these goods moves from B to A and then from A to C, the customs data will record only a flow from B to C. These supplies will enter into the inventories of the merchant in country A. Surveys of wholesale activity will record these inventory changes and given there have been no imports recorded, the economic accounts will look for domestic production, which of course is not there, to balance out the supply use accounts.

The revised BOP and SNA conventions call for the imputation of flows into and out of country A in line with the ownership changes. It may be practical to develop surveys in country A to gather information from the merchant and may be worthwhile if sufficient activity is present in the country that would distort the signals from these inventories owned outside the country. However, the benefits of collecting additional data on these transactions for countries B and C are much smaller and it is unlikely that they will adjust their data, thus leading to discrepancies in bilateral trade data.

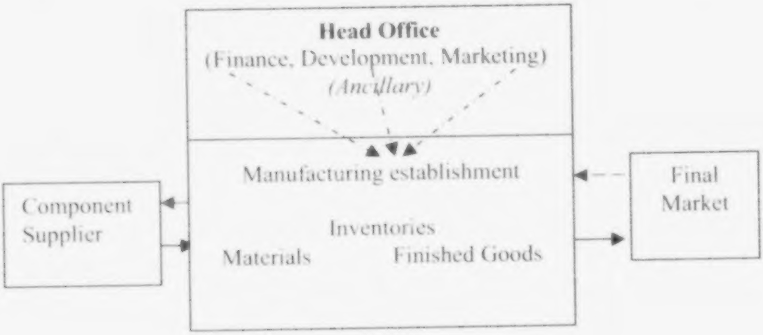
Goods Production

The goal is to have economic statistics for both production and trade that are consistent and thus provide information to policy makers and Canadians in general on how these aspects of the Canadian economy are developing. Therefore, before turning to look specifically at challenges faced in measuring trade in goods in more fragmented production processes, it may be helpful to review for a moment the traditional way the manufacturing production process is viewed in measuring economic statistics.

Diagram 6 provides a simple case of a producer of goods. The example here has one manufacturing establishment with a separate head office. The head office provides the financing, product development, and marketing, while the manufacturing establishment acquires the other inputs, manages the inventories, and produces finished goods for market.

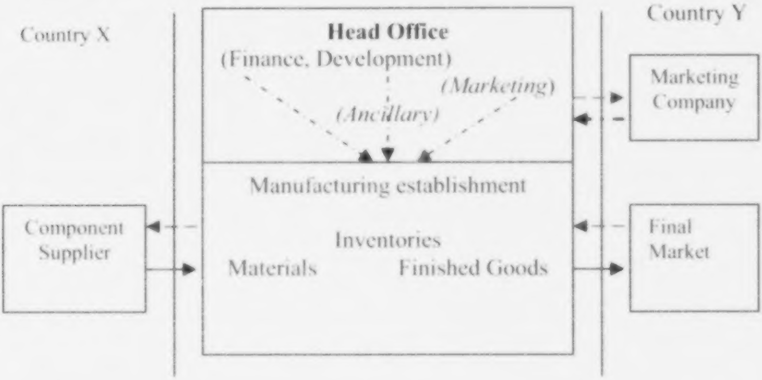
In the model, please note that the activities/outputs of the head office are considered ancillary services proved to the manufacturing establishment.

Diagram 6: Traditional View of Goods Production


Head Office
(Finance, Development, Marketing)
(Ancillary)
Manufacturing establishment
Inventories
Materials
Finished Goods
Component Supplier
Final Market

The model can explicitly be extended to include trade in goods and services as in Diagram 7. Note that if some of the services provided by the head office in the previous example are outsourced, then they are still treated as being supplied through to the manufacturing establishment.

Diagram 7: Traditional View of Goods Production with Trade in Goods and Services


Country X
Country Y
Head Office
(Finance, Development)
(Marketing)
(Ancillary)
Marketing Company
Manufacturing establishment
Component Supplier
Inventories
Materials
Finished Goods
Final Market

Outsourcing of the Goods Production

Diagram 8 provides an example with outsourcing of the procurement of input materials and the manufacturing process. In this case, all of the goods produced are "exported" to a country other than that of the head office or manufacturing plant. One could think of this as a case of line of products produced only for an export market.

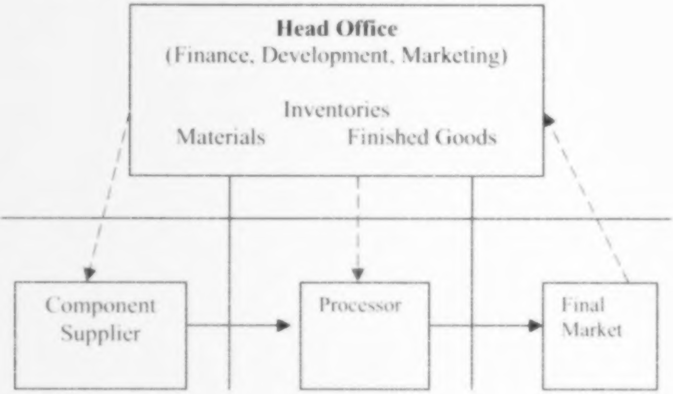
In this example the head office and the manufacturing plant are no longer in the same economy and are two separate enterprises. The head office still produces the financing, product development, and marketing but acquires all other inputs from outside the country. In this case, the head office enterprise buys all of the material inputs and has them sent to the establishment of the processor to be assembled. The head office maintains ownership of these materials as in the goods for processing case discussed earlier. Therefore, while processing may all take place outside of the country of the head office, it is the head office that bears the financial risks associated with carrying these inventories throughout the production process. This case also has elements of the merchanting case discussed earlier, as the head office acquired the ownership of these materials but they never physically enter the country, thus never appear in the customs data.

There are two important differences from the traditional view of the producing enterprise that should be noted:

- Inventories of materials and finished goods have moved from the manufacturing establishment to the head office.
- The services produced by the head office – finance, product development, and marketing – are no longer supplied to the manufacturing establishment.

In Diagram 8 the flows of goods and payments are indicated. It is clear immediately that the path followed by the cash to pay for these transactions does not correspond to the path followed by the goods themselves. Again this is similar to the merchanting example.

Diagram 8: Outsourcing Production for Export market – Flows of Goods and Cash



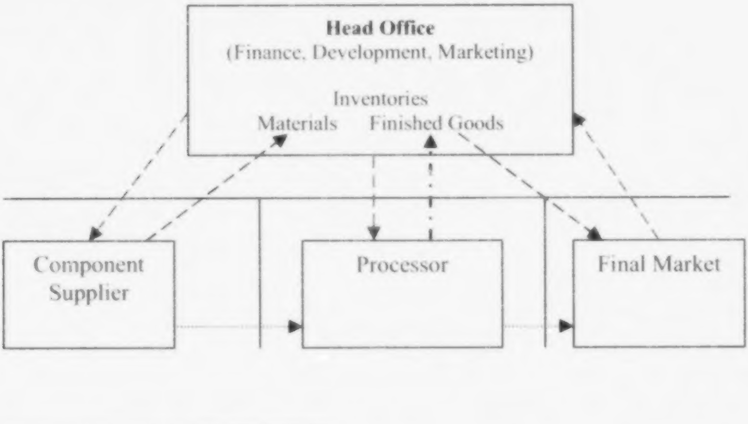
Using the principles noted earlier about ownership as a basis for recording, Diagram 8 indicates how economic data might be recorded to reflect the economic activities rather than the physical supply-use activities of this production process.

The purchase of materials would be shown as a transaction between the head office and the component supplier. The processing services would be supplied to the head office. The final sales of finished goods would be transactions between the head office and the final market economy.

The implication of this presentation of the economic data is that the head office, even though it has no manufacturing facilities or warehousing facilities, is the producer of the finished goods. While this does not correspond to the physical flow of the goods, it does recognize the behaviour of the economic agents in this situation. It is the head office that is undertaking the economic decisions that govern production, whereas the processor is offering a specific service only.

Ideally, to be consistent with this recording of production and trade, the bottom three countries in Diagram 9 would remove the goods flows from supplier to processor and on to final markets from each of their accounts[4]. However, as with the merchanting case described earlier, the information to undertake such adjustments may be difficult to obtain.

Diagram 9: Outsourcing Production for Export market – Economic Flows



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[4] Information on physical flows will still be important for economic development as infrastructure requirements are determined by these physical flows.

Diagram 9 shows four different countries. Canada can have enterprises that correspond to those shown in each of the countries. That is, we face the measurement challenges depicted in each of the four fictional countries. This section will take a brief look at the challenges in measuring the activity of each of the four enterprises.

Starting with the component supplier, the challenge is the geographical allocation of trade. The customs data will indicate the country of the processor while if we ask the supplier, the response would be the head office country. Surveys of goods producers such as this supplier ask for little on the geographic distribution of sales of goods, particularly for sales outside the country. This is, of course, because the customs data are used to provide this information. While value-added data will be correct, the information on trade patterns available to trade policy analysts and negotiators will be affected by how these transactions are measured.

Turning to the country of the processor, the information on the transactions between the processor and the head office will have to be collected by survey. Up to now in Canada these cases have been handled on a case-by-case basis, with special reporting arrangements set up with processors. It is not possible to identify the customs records associated with this processing activity and it is unlikely that this would change in the near future. If this activity is limited to a few large players, this case-by-case treatment can be used, but if it becomes (or already is?) more widespread, then this approach is too costly to be applied to a large number of cases.

The case of the final market economy is similar to that of the supplier country, in that the geographical allocation of supply based on the customs data and survey data would differ. Surveys of wholesale and retail firms importing goods do not ask for details on the geography of supply. There may also be a valuation difference if the value of imports declared for customs purposes does not correspond to the full value of the purchase price paid to the head office. Reconciliation of these values will only occur at a macro level in constructing the economic accounts.

The large challenge with measuring the economic activity of the head office is that surveys must be used to collect a lot of detail on the goods and service inputs and outputs of this enterprise. Collecting detailed commodity and geographical information using surveys is very burdensome on the respondent. However without sufficient detail on these commodities, it will be difficult to distinguish the traditional manufacturing operations from those which have outsourced significant parts of the production process.

Country of Origin and Ownership

Customs officials collect data on the "country of origin" of the product, which is based on customs rules for imports and the country of destination for exports. Also collected is the point of shipment. This transfer process also means that the shipper (exporter) may not know the ultimate destination of the goods, whereas the importer generally knows the country of origin due to the rules of origin.

This can result in significant differences in the bilateral trade figures for some country pairs. For example, Mexico reports about twice the value of imports from Canada as we report exports. The difference is largely goods that the exporter declares as going to the US but that are just passing through.

The case is similar for Chinese goods entering Canada. About half of the Chinese imports on a country-of-origin basis arrive in Canada having a point of shipping of either Hong Kong or the US.

If ownership is to be a fundamental basis for economic statistics, the question arises as to which of the geographical data on the customs record – country of origin or country of shipment – is the best indicator of the counterparty to the transaction. Are the Chinese goods transiting through the US on their way to Canada simply just 'in transit' or are they being acquired by an entity in the US which then distributes them (sells them) to a network of North American outlets?

Services Trade

Services trade is still the poor cousin but, as seen in earlier examples, fragmentation and reorganization of the production chain may be leading to significant increases in the relative shares of services trade. In the 'good old days' as it were, services were less of a concern. It was assumed that most services had to be produced and consumed at the same time so that the international trade in services was limited.

The ease with which producers can travel to other parts of the world and the advances in electronic delivery of many products has certainly changed the potential for international trade in services. In simple volume terms it is still much smaller than goods trade but services trade has seen much greater rates of growth for a number of years now.

The other point that is likely clear by now is that there is a growing fussiness about the differentiation of what a good is and what a service is. Thus, any exercise that is forward looking should cover both.

There are of course no customs documents for services[5]. The data for services trade generally come from business surveys. This measurement approach has very different strengths and weaknesses from the administrative process (customs) used for goods.

In general, businesses can more readily respond to surveys on their sales rather than purchases of inputs, particularly if one is asking about the geography of the transaction and the industrial activity of the counterparty. Whereas for goods the import data are generally of better quality, as customs administrations are more diligent about collecting duties owed and due more recently to security concerns, trade in services is better at measuring exports.

The use of surveys also limits the amount of detail on geography and commodity detail for services transacted, since asking for very specific detail on the service provided and the location of the counterparty rapidly becomes a very large burden for the respondent.

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[5] Customs documents are used to develop estimates of transportation services for the delivery of internationally traded goods.

Cross-Border Valuation and Transfer Pricing

While a significant proportion of international trade has for some time been between affiliated enterprises, it is difficult to identify these trade flows separately due to the use of brokers and other agents. It has been recognized that intra-firm transactions may reflect transfer pricing and thus affect the valuation of economic activity between economies.

The customs 'transactions' depicted in Diagram 3, even if they are with non-affiliated parties, may not reflect arms-length measures of economic valuation as the actual transaction taking place is for a service but the valuations that are being declared, and currently used in economic accounts, are for the goods crossing the border. It is generally assumed that the difference between the value of the goods entering for processing and those returning are equal to the contracted service from the processor.

The customs flows in the scenario in Diagram 9 are also displaced from the actual economic transactions with the customs values both entering and exiting the country of the processor, presumably based on the accounts of the head office.

If values declared for customs purposes are not the same as the actual transaction values then the difference will distort measures of economic activity.

Structural vs. Behaviour-Based Economic Data

A complete picture of the Canadian economy requires data on both the structural aspects of our economy and the behavioural aspects. The national accounts address the need for structural data primarily via the supply-use tables and the structural data published by individual surveys such as the annual survey of manufacturing. The behavioural data is primarily delivered via the sector accounts of the national accounts and related sector-specific data from programs such as those in the Balance of Payments and Public Institutions Divisions.

There is evidence that the organization of production and trade is changing. The challenge for the statistical system in part is to decide when these changes are sufficiently important to change the basic focus of the accounts and underlying surveys. To refocus the statistical system and move away from the traditional models used as the foundation of the economic data would be very costly.

The costs to adjust to a different focus are not only those that the statistical agency will have to bear but also those imposed on respondents if surveys are expanded. Significant changes to the model underlying data production may also cause discontinuities in some data series that will challenge analysts' capacity to understand the evolution of the economy. Of course remaining with the current model may obscure structural changes underway in the economy raising challenges for analysts.

Conclusion

There are clearly cases of each of the different models of economic activity discussed in this paper in the Canadian economy. What is less clear is the proportion of activity that falls into these different scenarios. The challenge for the statistical system is to find ways to measure these emerging phenomena in a manner that is cost efficient in terms of both response burden and budget. Given resource constraints, which activities—for example, goods for processing, merchanting, trade services—should perceive priority for development?

Consultation with policy makers, business respondents, academics, and other analysts will be important in mapping a way forward to address these important challenges. At the same time the statistical system needs to keep in step with international statistical developments if Canada is to have measures of economic activity that are comparable across countries.

Annex
Statistics Canada Programs Addressing Globalization

Statistics Canada has several longstanding programs that provide information on globalization issues . The balance of payments is the macroeconomic core of these measures with specific data available for key supporting programs such as international trade in goods, international trade in services and foreign direct investment. In addition, Statistics Canada has administered the Corporations Returns Act since its inception.

Corporations Returns Act

The original Corporations and Labour Unions Returns Act (CALURA) was introduced in 1962. Parliament amended the Act effective January 1999, changing it to the Corporations Returns Act (CRA) and removing the requirement for labour unions to report.

Under the CRA, Statistics Canada prepares an annual report to Parliament on the foreign ownership and control of Canadian businesses that examines financial and ownership information on corporations conducting business in Canada. This information is used to evaluate the extent and effect of non-resident control of the Canadian corporate economy. The CRA data are a primary source of information about mergers and acquisitions, foreign control of enterprises, corporate concentration and the legal structure of enterprises in Canada.

The ownership information collected from the returns filed by Canadian corporations under the Corporations Returns Act is publicly available by law and Statistics Canada uses the information to compile an inter-corporate ownership directory showing "which corporation owns which other corporation" in Canada. The directory tracks the ownership of the largest Canadian corporations and provides up-to-date information reflecting recent corporate takeovers and other substantial changes. Ultimate corporate control is determined through a careful study of holdings by corporations, the effects of options, insider holdings, convertible shares and interlocking directorships.

Finally, the data gathered under the Corporations Returns Act have been used to do further analysis on topics such as: the impact of mergers and acquisitions on corporate profits; changes in foreign control under different regulatory climates; the evolution of foreign bank subsidiaries and full-service branches in Canada; mergers and acquisitions and their relationship to foreign control; and foreign control and corporate concentration.

Foreign Direct Investment

Foreign direct investment has been an important source of capital for the Canadian economy for many years. In recent years Canada has also become an important supplier of foreign direct investment to other countries. Currently the net stock of assets resulting from foreign direct investment activities provides a positive contribution to Canada's net wealth, although the balance on portfolio investment continues to be negative.

The latest release of FDI position statistics showed outward FDI positions in around 150 countries. For direct investment coming from abroad (so-called inward FDI) the detailed statistics show investment positions from about 100 countries. Industry detail is also available. Data on FDI transactions and income are available with considerably less country detail (6 regions or countries). Confidentiality requirements constrain Statistics Canada's ability to release detailed FDI flow information, although the increased FDI activity in recent years and organizational and methodological changes within Statistics Canada may mean that additional flows detail and new indicators such as FDI statistics by country of control may be released in future.

Trade in Services

The increased specialization of production is leading to a greater importance for trade in services, which is relatively difficult to measure. Statistics Canada recently embarked on a three-year project to improve the data for international trade in services.

There are two main objectives for this project. The first aims at improving the accuracy of the annual estimates of total imports and total exports of commercial services within total trade in services. The population of Canadian businesses that are involved in international services transactions needs to be better identified, particularly with respect to small and medium sized businesses. Therefore, improved identification of the target universe is an important part of the business objective.

The second objective is to improve the commodity, geography and industry detail for trade in services estimates.

Commodity detail will be improved by collecting services commodity categories that map easily into the North American Product Classification System (NAPCS), the Central Product Classification (CPC) and the Extended Balance of Payments Service Classification (EBOPS). If it proves feasible, the number of services commodity categories collected on the annual trade in services survey will be increased. This survey currently collects international trade data for 32 services commodity categories.

With respect to geographical detail, a provincial breakdown of Canada's imports and exports of services by commodity will be developed on an annual basis. The project will also explore ways in which Statistics Canada's Balance of Payments program can respond to changing economic conditions and user requirements by modifying, as needed, the partner country aggregations and detail that are published. This approach aims at providing as much useful information as possible, while simultaneously respecting the need to maintain data confidentiality for individual enterprises and limiting the survey response burden.

In connection with the efforts to measure international trade in services more effectively, as part of its redesign of its annual program, Statistics Canada's services industries program is developing a new module that will allow for the collection of additional data on imports and exports of services in selected industries, at the same time as other services financial statistics are collected.

Trade in Intellectual Property, Licenses for Patents, Trademarks and Copyrights

Statistics Canada collects data on the technological balance of payments that include payments and receipts for the acquisition and use of patents, licenses, trademarks, designs, know-how and closely associated technical services, as well as for research and development services. The data derive from the Survey of Research and Development in Canadian Industry. The data on R&D services are reconciled with balance of payments data in order to find firms that purchase R&D services but perform no R&D themselves.

Trade in Goods: Exporter/Importer Registers

The international trade statistics program has produced an Exporter Register database which provides reliable counts of exporting establishments and their value of merchandise exports over the 1993 to 2004 period. An Importer Register database, currently under development, will provide similar data for Canadian importer establishments. Currently, preliminary importer data are available for 2002.

The Exporter Register provides an invaluable longitudinal database on the characteristics, performance and evolution of Canadian exporters. This information is delineated over several dimensions including industrial classification (NAICS), exporter size, destination of exports and province of residence of the exporter. This database provides counts of establishments exporting merchandise and the value of their exports by employment size category beginning with reference year 2000.

The Exporter Registry provides statistics on the characteristics of exporting firms. This is allowing research to be conducted on important policy issues such as the determinants of export success, and the relationship between exporting and productivity. This database provides empirical evidence to aid in the evaluation of many programs aimed at supporting and assisting exporters.

The Importer Register database will provide similar data for Canadian importer establishments. As noted, data are currently available for 2002 and data for 2003-2005 will be available in early 2007.

The union of the Exporter and Importer databases will contribute significantly to current research being conducted on issues such effects of recent exchange rate changes and other topics related to globalization.

Foreign Affiliate Trade Statistics

The delivery of services to international markets is often accomplished through foreign operations or foreign affiliates. Starting with data for 1999, Statistics Canada has an annual program that provides data on the sales and employment of these foreign affiliates of Canadian firms for both the goods and services sectors. This program shows that this delivery mode is more important than cross-border delivery of services.

Recent Developments and Future Challenges

More recently, Statistics Canada has taken decisions to reallocate resources to programs that can address data requirements in the general domain of globalization. The most important are the efforts to improve statistics for services output and productivity. These improvements can be grouped into three categories: (i) improved coverage of core industry data through an expanded annual services industries survey program; (ii) improvements to sub-annual indicators of economic activity and (iii) an expanded program of services price indexes. This note does not cover these, but descriptions are available in other documents.

This section describes some additional initiatives that have started very recently or are in the more advanced stages of development.

Globalization Project

In response to the data demands of policy makers and the new statistics proposed in the OECD Handbook mentioned earlier, Statistics Canada has allocated funds to a globalization indicators project. This project is focussing mainly on developing basic infrastructure for the production of additional globalization related data series. Subsequently, this new infrastructure will permit the development of a suite of globalization indicators.

An important feature of this project will be the identification of Canadian multinational enterprises (MNEs). While it has been possible to identify the operations of foreign multinational operations in Canada for some time using the Corporations Returns Act, it is only with the recent linking of the foreign direct investment program to the business register that Canadian multinationals can be easily identified.

Business Register

Statistics Canada's business register is presently under redevelopment and as part of this effort additional emphasis is being put on recording the international links between Canadian businesses and their foreign parents or subsidiaries. Key characteristics of these linkages will be recorded to support future data development and research.

Several data sources will be tabulated by ownership class (foreign MNE, Canadian MNE, and non-MNE) and by trade status (importers, exporters, both, or neither) to indicate the level of globalization of the Canadian economy.

1. Principal statistics from the annual Survey of Manufactures will be tabulated by ownership class and trade status for reference years 2000 through 2004 (2005 where available). Statistical tables will be produced by industry and province. The principal industrial statistics include shipments, employment, salaries and wages, cost of materials and supplies used, cost of energy used, goods purchased for resale and manufacturing value added.
2. Investment expenditures data (both construction and machinery and equipment) will be produced by ownership class and by trade status for reference years 2000 through 2005 (2006 where available). Estimates will be prepared by industry and province.
3. Statistics on research and development expenditures in Canadian industry will be produced by ownership class and trade status for reference years 2000 through 2004 (2005

where available). Variables such as sources of funds for intramural R&D and value and type of intramural expenditures will be included.

4. In addition, results from the market and supply chain questions included on the 2005 Innovation Survey, which targets the manufacturing and logging industries, will be tabulated and analyzed. The analysis will explore variations by ownership class and trade status, and by industry and province.

Global Value Chains Data Development – Feasibility Study

A feasibility study was recently approved by the Policy Research Data Group that will present and examine different options for collecting data on the phenomena of global value chains, and recommend a course of action for so doing. The study proposes to do the following things:

1. Clarify concepts and definitions. The U.S. Congressional Government Accountability Office developed a conceptual framework that defined offshoring in relation to other related concepts such as foreign direct investment and trade. The OECD has adopted this conceptual framework and several countries have used it to develop surveys and perform research. There is, however, some work to be done for the implementation of these concepts in survey-taking. This means certain concepts associated with offshoring need to be related to concrete and measurable activities and characteristics. First, the business functions that are offshored need to be classified in a meaningful way (e.g. legal functions, payroll functions). Second, the characteristics of those functions need to be classified (e.g. knowledge intensive, high wage, capital intensive, intellectual property related). Third, the forms that the offshoring relationships take must be classified (e.g. contracts, joint ventures, equity).
2. Review the results from other countries' surveys on offshoring, as well as Canadian surveys related to the matter. This is important background for the development of options for the subsequent steps. With respect to the Canadian situation,

the intent is to build upon the expertise gained in the following surveys which had questions related to offshoring: 2005 Innovation Survey, Natural Health Products Survey, Language Industry Survey, and the functional Foods and Nutraceuticals Survey.

3. Describe and recommend the survey strategy. The strategic elements include the choice of observation unit and the proposed survey frame, and the description and field-testing of a survey vehicle. The final sample size will be dependent on the amount of detail expected to be derived from the sample (geography, firm size, firm ownership and industrial detail).

Commercialization

Funding was also approved by the Policy Research Data Group to undertake a pilot survey of commercialization activities in Canada. This survey will examine how new developments are brought to market, both for projects undertaken in Canada and commercialized here and for projects developed by Canadian firms outside the country to exploit new market opportunities. The survey will be conducted in 2007 for reference year 2006.

International Labour Supply and Remittances

Globalization is not just a business enterprise phenomenon. With an increasing proportion of the labour supply in many countries coming from temporary and permanent migration, households and extended families are becoming more global.

The large immigrant populations in many countries, including Canada, transfer significant amounts of resources to their home countries to support family members that remain behind. The importance of developing reliable estimates of these international remittances by persons has been recognized by international financial and statistical organizations, as well as by the leaders of the G8 countries at the Sea Island Summit in July 2004. Canadian measures of these flows are poor and the possibility of improving these data is being reviewed.

The Survey of Household Spending (SHS) collects some data on this phenomenon, but the variance is high given that the sample is not designed to ensure adequate representation of the immigrant population for this particular purpose. Furthermore, the SHS does not provide any breakdown of remittance payments by country of destination. It may prove feasible to improve Canadian remittance statistics either through changes to existing survey vehicles or as part of a new household survey. Some relevant changes are planned for the Survey of Labour and Income Dynamics (SLID), including questions about household-to-household transfer payments.

The Longitudinal Survey of Immigrants does pose questions related to international household-to-household transfers. However, a major restriction is that the target population includes only the immigrant people who arrived in Canada between October 2000 and September 2001, which is not representative of Canada's immigrant population as a whole for this particular purpose. Nonetheless, it may be possible to derive some useful conclusions.

Whereas most industrialized countries produce separate estimates for employment income transactions with non-residents, Canada does not. A project to improve statistics regarding international compensation of employees was launched in early 2006. The project is exploiting administrative data. Updated statistics on earnings of foreign residents employed by Canadian employers are expected later in 2006. It may not prove possible to improve statistics on the earnings of Canadians employed by foreign employers via domestic administrative data sources. Therefore, an exchange of statistics with partner countries will be examined. An additional benefit is that some results of this project will likely be useful for improving estimates of other components of the balance of payments such as remittance statistics and a special class of trade in services statistics, identified as "mode 4" in the General Agreement on Trade in Services (GATS), where a service supplier of one country travels to another country to deliver the service.

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Trade Theory, Trade Policy, and Cross-Border Integration

Michael Hart and Bill Dymond*

Introduction

In a 1992 article, economist Paul Krugman asked whether the new trade theory required a new trade policy. He concluded that it did not, arguing that since existing trade policies were unrelated to long-established trade theories[1], it was difficult to see why such policies needed to accommodate new theoretical insights. In his view, "GATT-think [is] a simple set of principles that is entirely consistent, explains most of what goes on in the negotiations, but makes no sense in economic terms."[2] Krugman's point was clever but also misleading because it did not fully appreciate either the nature or the genius of the international trade regime, or the challenges it needed to address in the face of deepening global integration. The system of rules and procedures worked out and applied in the period from the founding of the US Reciprocal Trade Agreements program in 1934 through the Uruguay Round of GATT negotiations in the 1990s embodied more sensible economic content than Krugman cared to admit. At the same time, he seemed to discount the extent to which there needed to be new thinking about trade policy, some of it in response to new trade theories developed over the past few decades, but even more to take account of the changing nature of international production and exchange.

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[1] Theories first developed by, *inter alia*, Adam Smith and David Ricardo (specialization and comparative advantage) and refined over the years by economists like Eli Heckscher, Bertil Ohlin, and Paul Samuelson (the factor proportions theory) and Ray Vernon (the product cycle theory), and now supplemented by theories to take account of imperfect competition, increasing returns to scale, and other factors.

[2] "Does the New Trade Theory Require a New Trade Policy?" *The World Economy* 15:4 (July 1992), p. 429. See Douglas Irwin, *Against the Tide: An Intellectual History of Free Trade* (Princeton: Princeton University Press, 1996) for a full discussion of the development of trade theories and the broad commitment of economists to the doctrine of free trade.

The new thinking needs to learn from insights developed in industrial organization theory, economic geography, business economics, and other domestically oriented sub-branches of micro-economics, suggesting that there are fewer differences between international trade and domestic commerce than was long assumed. As Krugman himself explained in a later article, "the trend in manufacturing has been to slice up the value chain—to produce a good in a number of locations, adding a little bit of value at each stage."[3] This kind of fragmentation was originally confined to the firm and then to spatially proximate and, often, related firms. Increasingly, however, neither geography nor ownership remain as serious obstacles to the fragmentation of production and its subsequent integration. Even more pertinent to international trade, national borders are no longer significant barriers to the organization of production. Insights into the nature of production and the operations of private firms have opened up new ways of explaining international trade and investment. They have also suggested the need for new thinking about the object and purpose of trade and related negotiations among governments.

The old trade policy, despite Krugman's dismissal of GATT-think, was firmly grounded on the theory of comparative advantage. It assumed that trade is largely a matter of exchanging goods, that it takes place between national economies, reflecting each country's resource endowments and comparative advantage. It further implicitly assumed that national production was associated with the use of mostly domestic resources, meaning that export expansion was associated with a commensurate increase in domestic value-added, jobs and profits. The old trade policy sought to remove national barriers to trade in goods on a progressive, i.e., politically sustainable, basis and to make the rules of the game fair, transparent, and non-discriminatory. Those were the means; the objective was to let markets work in order to take advantage of specialization and thus contribute to growth in national and global welfare. It worked: among OECD economies, trade grew at a rate that far outstripped growth in production to the point that an increasing share of national welfare was being derived from international exchange. Interestingly, as international trade and investment flourished, more and more could not be explained solely on the basis of comparative advantage and national endowments. Economists responded with a range of more sophisticated explanations, including insights derived from analysis of the domestic economy[4].

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[3] Paul Krugman, "Growing World Trade: Causes and Consequences." *Brookings Papers on Economic Activity*, 1 (1995), p. 334.

Of course, Krugman was reluctant to admit that the global economy was beginning to operate more and more like the large, continental US economy of the early post-war years. In the 1990s, he popularized sophisticated economic arguments to demonstrate the extent to which production in the United States was still largely focused on goods and services consumed at home[5]. In terms of a traditional reading of trade statistics, he was right, but in pointing out that some of the economic problems being experienced in the United States at that time were homegrown, he missed another point: traditional ways of interpreting trade statistics no longer captured the extent of international economic interdependence. As Douglas Irwin points out, "A close analysis of the merchandise trade figures indicates that trade is substantially more important now than in the recent past for those sectors engaged in trade."[6] He calculated that US merchandise exports as a share of merchandise production grew from 15 percent in 1970 to nearly 40 percent in 1999, even though the share of merchandise trade to GDP grew much more modestly, largely because of the growth of service production as a share of GDP. In Canada, the exports of goods in 1999 represented 125 percent of the value of goods production, consistent with the high level of imports in Canadian exports and the much more export-intensive nature of production in Canada. The comparable figure for 1970 was 65 percent, suggesting a similar rise in the export intensity of the economy[7].

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[4] See, for example, Patricia Dillon, James Lehman, and Thomas D. Willett, "Assessing the Usefulness of International Trade Theory for Policy Analysis," in John S. Odell and Thomas D. Willett, eds., *International Trade Policies: Gains from Exchange between Economics and Political Science* (Ann Arbor: University of Michigan Press, 1990), pp. 21-54 for discussion of some of the newer trade theories.

[5] See, for example, "Competitiveness: A Dangerous Delusion," *Foreign Affairs*, vol. 73, no. 2 (1994); 'Does Third-World Growth Hurt First World Prosperity?' *Harvard Business Review*, July-August 1994; and with Robert Lawrence, 'Trade, Jobs and Wages,' *Scientific American*, April 1994.

Cross-border fragmentation and integration of production between Canada and the United States started well before it had become commonplace on a global scale. As a result of the 1965 Autopact, automotive production in the two countries was reorganized in the 1960s to allow the major assemblers and their suppliers to integrate their facilities on both sides of the border and thus provide scope for more specialization and the benefits that flow from economies of scale and larger markets. As border barriers came down, other industries followed suit, a process that deepened and accelerated following the implementation of the 1989 Canada-US Free Trade Agreement (CUSFTA) and the 1994 North American Free Trade Agreement (NAFTA).

In this paper, we consider the implications of deepening and accelerating cross-border integration for North American trade policy. We argue that the benefits that flowed to the two economies from the conventional trade negotiations of the past have now been largely realized. More benefits have flowed from the more innovative provisions in the CUSFTA and NAFTA. Nevertheless, there remain barriers to the full exploitation of cross-border integration. To achieve these additional benefits, a concerted effort will be required to address the combined impact of dated, dysfunctional, and intrusive border administration, the haphazard process leading to deepening regulatory convergence, and the frail institutional capacity to govern accelerating integration, together with an expansion of the reach of binational policy-making to address investment, intellectual property rights, labour, services, and other economic transactions.

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[6] Douglas A. Irwin, *Free Trade Under Fire*, 2nd edition (Princeton: Princeton University Press, 2005), p. 8.

[7] Values calculated from Statistics Canada GDP and Balance of Payments data.

Thus, while the trade policy of the past may have reached the point of diminishing returns, new challenges have arisen that we believe to be amenable to resolution through bilateral negotiations. Progress on these issues requires a better understanding of the successes and limitations of the old trade policy, the contribution of regional trade negotiations, the nature of modern production and exchange, their cross-border manifestation between Canada and the United, and the barriers to their full development. Following a discussion of these factors, we will consider the new trade policy issues that need to be addressed between Canada and the United States and the benefits that should flow from their successful resolution.

The Old Trade Policy

Over a period of some fifty years—from its first deployment in the US Reciprocal Trade Agreements Program in the 1930s through the conclusion of the Tokyo Round of multilateral trade negotiations in the 1970s and into the opening of the Uruguay Round in the 1980s—trade negotiations grounded in mercantilist bargaining and negative prescription proved an unqualified success for those countries prepared to take advantage of this strategy. The result provided the basis for a tremendous increase in international trade and a major boost in productivity and prosperity. Mercantilist bargaining offered a politically acceptable way to pursue politically difficult economic goals.

Through such trade negotiations, governments sought to increase economic welfare by reducing discrimination, removing barriers, disciplining potentially distorting policy measures, and providing greater scope for the operation of the market, unencumbered by artificial policy barriers. They also sought the order and stability that come with clear rules and equitable dispute settlement provisions. In short, both legal and economic maxims suggested that international trade agreements were mutually beneficial. Every barrier removed or rule established would benefit all participants.

Such trade negotiations, however, were in fact pursued on the basis of pre-economic and pre-legal concepts: every "concession" granted by one party had to be matched by a "concession" from another. Ministers and their officials, while they knew better, behaved as if they were engaged in a zero-sum game. Reason told them that the removal of barriers and the establishment of rules made sense, but politics dictated that they could only achieve these goals by seeking greater export opportunities while minimizing the prospect and benefits of increased import competition. Political discourse was based on the conceit that the strength of the nation required a positive trade balance, an ability to do without imports, and the promotion of strategic advantage over all other nations. British economist Martin Wolf first called this process mercantilist bargaining and suggested that, perversely, it was only through mercantilist bargaining that progress could be made[8].

Mercantilist bargaining also proved superbly suited to the architecture of the US-inspired reciprocal trade agreement: an interlocking set of negative prescriptions by which governments undertook self-denying ordinances disciplining their capacity to impose trade barriers at the border and to discriminate among domestic and imported goods or among their trading partners.

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[8] See Martin Wolf, "A European Perspective," in Robert M. Stern, Philip H. Trezise and John Whalley, eds., *Perspectives on a U.S.-Canadian Free Trade Agreement* (Washington: Brookings Institution, 1987). In *Why Globalization Works* (New Haven: Yale University Press, 2004), he provides a much more complete picture of the role of trade negotiations in spreading the benefits of globalization.

Its substantive obligations required participants to refrain from applying their trade policies in ways that were contrary to these fundamental rules. The obligations did not require adherence to absolute standards of behaviour, nor did they impose rules and procedures for the detailed administration of trade policy. There was no obligation in the GATT, for example, to set maximum tariff rates. GATT members remained free to negotiate such rates and free to apply them at lower levels or not all. The basic national treatment obligation did not guarantee a standard of treatment for imports, for example, respecting the level of indirect taxes, but rather required that such taxes or other regulations affecting internal trade not be higher or more burdensome than those applied to products of domestic origin.

With respect to non-tariff barriers, the GATT did not require its members to apply countervailing or antidumping measures, marks of origin, quantitative restrictions on trade, or subsidies, but rather established disciplines on the use of such measures. The articles allowing exceptions for balance-of-payment reasons, tariff preferences, or import surges were similarly encumbered with disciplines and in some cases surveillance, all intended to make their use difficult. While the articles on customs administration and valuation set out prescriptive rules and procedures, the need for such measures arose from the application of an import regime which the GATT did not substantively require[9]. The arch over all these obligations was the general requirement of most-favoured-nation treatment.

The focus of these negotiations was barriers to the exchange of goods. Barriers to the flows of services, investment capital, the internationalization of intellectual property rights, temporary business travel, labour, and other cross-border transactions were governed, if at all, by separate international instruments, none of which included the kinds of rights and obligations that became the basis of the trade-in-goods regime. International air services, for example, were governed on the basis of a series of interlocking bilateral arrangements that were crafted not only on the basis of mercantilist bargaining, but pursued in order to achieve mercantilist results. Unlike the equality of opportunity that was critical to the goods regime, the patchwork of other international arrangements was much more geared to specific outcomes. The intellectual property regime embedded in the arrangements administered in the World Intellectual Property Organization (WIPO) relied on comity rather than enforceable contract.

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[9] Article X on the publication and administration of trade regulations is an exception to the paradigm of negative prescription. It should be added, however, that the existence of a body of norms (rather than requirements), did lead to a gradual convergence in the trade policies of the core GATT members, the industrialized countries clustered around the North Atlantic.

In the six rounds of multilateral trade negotiations between the provisional entry into force of the GATT in 1948 and the completion of the Tokyo Round in 1979, there was no significant change in this fundamental architecture. The focus of each negotiation was the reduction of tariffs on industrial goods through mercantilist bargaining. While the Kennedy and Tokyo Rounds expanded negotiations beyond tariffs to the development of disciplines on export and internal subsidies, the application of countervailing and antidumping duties, and separate agreements on trade in civil aircraft and government procurement, the results were fully consistent with the principle of negative prescription[10]. In two areas of the Tokyo Round, however, there was already evidence of the pending shift in the centre of gravity from negative prescription to positive rule-making. Agreements governing customs valuation and technical barriers made a tentative start at requiring adherents to administer regulations along specified lines. Neither agreement, however, required countries to impose a tariff on imports or to maintain a products standards regime.

The Uruguay Round fundamentally altered the nature of the GATT-based trade relations system[11]. In addition to some major achievements within the traditional framework, it made a decisive shift toward positive rule-making as the basis for a new architecture of international trade rules. It also sought to extend the ambit of the rules to other economic transactions, particularly trade in services, some trade-related aspects of investment, and intellectual property rights. The shift into rule-making is particularly apparent in the agreements governing trade in services, the protection of intellectual property, technical barriers, and sanitary and phytosanitary measures, and in parts of the agriculture agreement[12]. When combined with the positive obligation to ensure conformity with WTO rules, a more potent dispute settlement system, the trade policy review mechanism, and the new disciplines on services and intellectual property rights, the WTO institutionalized a degree and intensity of intervention into domestic governance which exceeds anything possible or contemplated under the GATT.

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[10] For an analysis of the Tokyo Round, its origins, its objectives, issues and results see Gilbert R. Winham, *International Trade and the Tokyo Round Negotiation* (Princeton: Princeton University Press, 1986).

[11] For a useful summary, see Jeffrey J. Schott, *The Uruguay Round: An Assessment* (Washington: Institute for International Economics, 1994). See

The stalemate at the Doha Round of negotiations suggests that the transition from a regime of negative to positive rules was not fully thought through. The bargaining techniques that had worked so well for more than fifty years proved less well suited to the emerging architecture and the much more comprehensive ambit of the rules. As discussed further below, regional negotiations relied less on mercantilist bargaining and proved more adept at dealing with the politically tricky issues inherent in positive rule making. Nevertheless, the GATT trade relations system, now encompassed in the 1995 World Trade Organization Agreement, proved an enduring idea and continues to be at the centre of the modern trade relations system. It was based on several key assumptions:

- trade policy should be non-discriminatory, as expressed in the principles of unconditional most-favoured-nation treatment and national treatment;

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also John Croome: *The Results of the Uruguay Round: A Guide*, (Geneva: WTO, 1995).

[12] We explore the detail of what this entailed in "Post-Modern Trade Policy: Reflections on the Challenges to Multilateral Trade Negotiations After Seattle," *Journal of World Trade* 34:3 (June 2000).

- the primary regulator of trade should be the highly visible mechanism of the tariff, a mechanism that affects prices, rather than other mechanisms such as quantitative restrictions;
- tariffs and other barriers to trade should be progressively reduced so that the gains from trade can be realized and economic welfare increased;
- trade results largely from the activity of private entrepreneurs rather than governments;
- governments should be allowed to impose barriers against dumped or subsidized or otherwise politically intolerable levels of imports; and
- disputes between members should be resolved through a process of consultation and negotiation; retaliation and counter-retaliation should be avoided.

Over the years, the system became increasingly complex in order to compensate for the failure of the more ambitious International Trade Organization (ITO) to come into being. Despite these difficulties, the cumulative impact of the GATT—and now the WTO—was significant. Merchandise trade was liberalized, particularly among the advanced industrial economies; tariffs were cut; old-fashioned discriminatory quantitative restrictions were eliminated; and many potentially harmful practices were restrained by its rules[13].

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[13] Its impact was much more limited in curbing the protectionist instincts of developing country governments. As a result, their participation in the benefits of international trade was much more limited, a reality that is only now beginning to be addressed by some developing countries through unilateral measures and bilateral arrangements. We explore the perverse impact of special and differential treatment for developing countries and their governments' approach to multilateral negotiations in "Special and Differential Treatment and the Doha 'Development' Round," *Journal of World Trade* 37:2 (April 2003). Gary Hufbauer sarcastically points out, "everyone 'knows' that trade ministers representing poor countries can't be asked to dismantle their barriers because … well, because they like to use muddled infant industry arguments to confer favours on well-connected constituents." "Inconsistency between Diagnosis and Treatment," *Journal of International Economic Law*, 8:2 (June 2005), p. 293.

Mercantilist bargaining proved a politically successful way to harness the power of comparative advantage and its benefits can be clearly explained on the basis of conventional trade theories, particularly the Heckscher-Ohlin-Samuelson model. But these models rely on a stylized explanation of the mechanics of production and international trade that is increasingly far removed from current experience in the real economy. The way firms are organized to produce goods and services for either domestic consumption or export is of little moment to trade theory; industrial organization (IO) theory can be used to describe it, but few bridges were built to integrate the theories developed in these two branches of micro-economics until recently. Industrial organization theories explain the organization of production while international trade theories explain the exchange across national borders of the resulting goods and services. Traditional trade policy thinking and practice continues to rely on this division of labour and remains poorly informed on emerging IO theory.

The old trade policy assumed that international trade, investment, and other cross-border transactions took place largely between firms and individuals in one country and unrelated firms and individuals in another. It regarded the large, vertically integrated, horizontally diversified, managerially coordinated enterprise famously described by Alfred Chandler as typical[14]. With the exception of raw materials, machinery, and luxury products, experience suggested that goods and services were primarily consumed in the country in which they were produced by such firms. Goods and, to some extent, services were also produced for export but the successful penetration of a market often led to import-substituting investments and a return to the dominant pattern of domestic production for local consumption. International transactions thus largely involved sales of primary goods, machinery, and luxury goods, exports of excess production, establishment of foreign affiliates through foreign direct investment, transfers of technology through affiliates and licensing arrangements, and the provision of various supporting services such as transportation, communication, and insurance. Nevertheless, in response to market liberalization, particularly among members of the Organization for Economic Cooperation and Development (OECD), exports steadily increased as a share of global output, rising from about 7 percent in 1950 to about 15 percent by the mid-1970s[15].

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[14] Alfred Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge: Harvard University Press, 1977) and *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge: Harvard University Press, 1990). Chandler's work was given important theoretical underpinnings in Oliver Williamson, *The Economic Institutions of Capitalism* (New York: The Free Press, 1985), relating the structure and operation of these firms to emerging theories about transaction costs, imperfect competition, and more.

Lessons from Regional Negotiations

Mercantilist bargaining was not the basis upon which the members of the European Union negotiated the treaties that formed the basis for their increasingly integrationist project, nor was it the basis for concluding the Canada-United States Free Trade Agreement or the North American Free Trade Agreement. Each of these negotiations sought a much more thorough approach to rule-making and the resulting agreements reflect a detailed construction of rules to govern deepening integration among its members. They set out to cover the full range of cross-border transactions, from labour and capital to services and intellectual property rights. From the outset, these negotiations aimed at encouraging efficiency and integration, rather than simply the mercantilist goal of increased exports. In some ways, these regional negotiations reflected the full implementation of the logic of the old trade policy, but in other ways tried to come to grips with the demands of promoting and governing deeper integration.

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[15] The WTO calculates that the ratio of world trade in goods and services to output increased from 7 to 15 per cent over the period 1950 to 1974, and from 15 to 28 per cent between 1974 and 2004 , i.e., it has quadrupled since 1950. It grew most rapidly in the first two decades, slowed perceptibly during the 1970s and 1980s, and again grew rapidly since, consistent with, first, the impact of post-war recovery, and second, the impact of regional and global integration. See WTO, *International Trade Trends and Statistics* (Geneva: WTO, 1996 and 2006), accessed at wto.org. A recent *Economist* survey focuses on the extent to which the more recent surge has integrated developing country producers more fully into global production, trade, and investment patterns. "The new titans," *The Economist*, September 14, 2006.

Against a background of nearly half a century of depression and war, European governments in the 1950s embarked on an ambitious program of political cooperation and economic integration. Based on the deeply held conviction that countries that trade with each other and have an interest in each others' economic welfare are less likely to go to war or engage in destructive protectionist strategies, western European governments pursued top-down, policy-induced economic integration[16]. Over the course of the past five decades, the European integration movement has steadily expanded from the original six to now 27 member states, plus association arrangements with neighbours, potential members, and former colonies.

Simultaneous to the widening of the EC/EU, member governments steadily worked to deepen its impact. The 1957 Treaty of Rome committed members to implement the four freedoms: free movement of goods, services, capital, and people. Implementation of the free movement of goods was effected by removing intra-European tariff and non-tariff barriers and by adopting a Common External Tariff and a Common Agricultural Policy. This was accomplished by the original six members by 1968 and became a condition of entry for all subsequent members. The free movement of the other factors of production, however, proved a much more daunting challenge. In effect, it required a high degree of convergence in the regulatory regimes that are at the heart of the modern welfare state and that, either directly or indirectly, operate to segment national markets and frustrate integration. Over the past 20 years, through a process of both legislation and litigation, members of the EU succeeded in creating the rules and structures required to govern a continent-wide single market. As Michelle Egan points out, by closely emulating the US experience in creating an integrated, continent-wide market in the 19th century, the EU succeeded in erasing borders and creating a similarly integrated market in Europe. In the United States, the Constitution's Commerce clause and the courts proved critical, while the EU relied on the Treaty of Rome and the European Court of Justice[17].

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[16] Noted Jean Monnet, the father of European integration, in one of the most-quoted passages from his Memoirs "There will be no peace in Europe if States reconstitute themselves on a basis of national sovereignty. … European States should form themselves into a federation or a 'European entity' which would make them a joint economic unit." *Memoirs* (Garden City, NJ: Doubleday, 1978).

The two North American Agreements, on the other hand, reflected an effort by first Canada and the United States, and then Mexico, to catch up to the reality of market-driven, cross-border integration by negotiating a framework of rules consonant with that reality. Rather than the push of government action, Canada-US integration has been driven largely by the pull of market forces: proximity, consumer choice, investment preference, and firm behaviour. Government policy has been largely responsive, motivated by efforts to resolve problems generated by market-driven integration. Rather than seeking deeper integration, governments only gradually accepted the need to facilitate it by addressing problems experienced by private traders and investors. The result is a much more piecemeal and less deliberate approach to rule-making and institution-building. Unlike in Europe, the governmental response in North America has been prompted by commercial and economic considerations and has been at pains to keep geopolitical and security considerations at arm's length in forging new rules and arrangements to address deepening economic integration.

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[17] See Michelle P. Egan, *Constructing a European Market: Standards, Regulation, and Governance* (New York: Oxford University Press, 2001). The American parallel is instructive, particularly in light of Canada's own more difficult progress in effecting a more integrated market through the Internal Trade Agreement. For Canadians, perhaps the most instructive lesson from Europe does not lie in efforts to create first a customs union and then a single market, but in the efforts of the Outer Seven—the members of the European Free Trade Association (EFTA)—first to maintain their separate markets, then to negotiate individual free-trade agreements followed by the short-lived European Economic Area (EEA) arrangement and finally full participation in the single market for most EFTA members. The logic of the market drove decisions about its governance.

British economist David Henderson defines integration "as a tendency for the economic significance of political boundaries to diminish."[18] It takes place when one or more formerly separated markets combine to form a single market, leading to increased flows of cross-border trade of not only final consumer products but also intermediate inputs and raw materials, as firms reorganize their activities around regional markets for both inputs and outputs. Integration enables producers and consumers to benefit more fully from their relative strengths and to respond more efficiently to changing economic conditions. It may open new territories for an economy's output, strengthen exploitation of economies of scale, increase access to potentially cheaper suppliers of inputs, and create new opportunities for foreign direct investment, as firms restructure the vertical and horizontal arrangements of their enterprises. Greater competition is also likely to make goods and services more affordable, thereby expanding consumer purchasing power, and add to consumer choice.

Whether driven by the push of government policy or the pull of market forces, deepening integration between two or more countries disposes them to create common policies to regulate the production and distribution of goods and services and a joint approach to external trade and investment. Canada and the United States, while nominally committed to no more than a free-trade area, have in reality already implemented aspects of a customs union and even of a common market. Based on broadly shared goals and perspectives and common needs, the two governments have developed a dense framework of formal and informal networks and relationships that ensures a high degree of convergence in the design and implementation of a wide range of rules and regulations.

Both the European treaties and the North American agreements are built on an architecture of positive rules rather than negative prescriptions, and neither was the product of mercantilist bargaining. Both are much more ambitious in their coverage. Both anticipate the new trade policy and both reflect the much more intensive nature of exchange within the territory covered by the rules. In the case of Europe, the treaties helped to forge more integrative business strategies. In the case of North American, the agreements reflected the extent to which business was pursuing more integrative strategies. In both instances, the architecture and bargaining strategy of the old trade policy proved ill-suited.

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[18] David Henderson, "Putting 'Trade Blocs' into Perspective," in Vincent Cable and David Henderson, eds., *Trade Blocs? The Future of Regional Integration* (London: Royal Institute of International Affairs, 1994), pp. 179-80.

The effective market today is global and its reach is increasingly reflected in the organization of production. The United States in the 19th century and the EU, and to a lesser extent, Canada in the closing years of the 20th century, saw a need to forge rules and governance structures consonant with the emergence of larger markets and more widely integrated production strategies. The focus of these efforts was divergent regulatory regimes that artificially segmented markets and frustrated achieving the benefits of wider markets and more efficient production structures. Today, both markets and production have gone global, while governance remains largely national in scope and reach.

The New Industrial Context: Fragmentation and Integration

Over the past few decades, traditional international exchange has gradually begun to give way to a much more integrated kind, with more and more transborder transactions taking place within firms, among related parties, or within integrated networks[19]. Many more goods traded internationally today are parts and components for assembly into end-products closer to the point of final consumption. Production is being geared to a much wider market, the range of goods and services that are exchanged internationally has widened considerably, and capital and technology move between nations not only to promote import-substituting, but also export-oriented production. Global competition, scientific and technological breakthroughs, as well as consumer sophistication are shortening the product cycle and placing a premium on quality, manufacturing fluidity, and ininnovation. International exchange now involves a much more complex and sophisticated range of economic transactions and is as likely to involve dealings among related than unrelated parties. The vertically integrated firms of the early postwar years have given way to much more flexible, horizontally organized enterprises[20]. Production is steadily being re-organized on a global basis and the nature of extra-national economic transactions reflects this change. In the words of the University of Manchester's Peter Dicken, the global economy has been transformed into "a highly complex, kaleidoscopic structure involving the fragmentation of many production processes, and their geographical relocation on a global scale in ways which slice through national boundaries."[21]

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[19] The UNCTAD Division on Transnational Corporations and Investment reports that by 2005, some 77,000 firms qualified as multinational in their activities, each accounting for an average of ten separate foreign affiliates. World-wide sales by foreign affiliates had reached US$22.2 trillion in 2005, nearly double world-wide exports of goods and services at US$12.6 trillion. See World Investment Report (Geneva: UNCTAD, 2006).

The literature suggests that there were three basic catalysts to the acceleration of globalization: the steady liberalization of trade and investment among industrialized countries after the Second World War, the more recent rapid industrialization of the third world, and the impact of technological breakthroughs that have brought down the costs of transportation and communication. The impact of these three factors has been mutually reinforcing and cumulative. Duke University sociologist Gary Gereffi insists, however, that "of far greater significance are several novel features in the nature of international trade that do not have counterparts in previous eras. ... The three new aspects of modern world trade relevant here are (1) the rise of intra-industry and intra-product trade in intermediate inputs; (2) the ability of producers to 'slice up the value chain,' in Krugman's phrase, by breaking a production process into many geographically separated steps; and (3) the emergence of a global production networks framework that highlights how these shifts have altered governance structures and the distribution of gains in the global economy."[22]

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[20] See Naomi R. Lamoreaux, Daniel M.G. Raff, and Peter Temin, "Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History," *American Historical Review* 108 (April 2003), pp. 404-33. Much of the article is a critical analysis of the lessons of business history since Chandler wrote *The Visible Hand*.

[21] Peter Dicken, *Global Shift: Reshaping the Global Economic Map in the 21st Century* (4th edition, London: Sage, 2003), p. 9.

The fragmentation of production through a process of outsourcing and subsequent re-bundling within large and technologically sophisticated supplier networks has become increasingly prevalent in industries from food processing, aviation, and motor vehicles to apparel, electronics, and house-hold products[23]. Both value-chain fragmentation and the sophistication of the firms that make up the fragments have made it easier to relocate specific nodes of production and to take advantage of a range of distant factors, from low-cost labour and specialized skills to access to critical inputs and public policy considerations. As the production of manufactured goods becomes ever more disaggregated, varied, and sophisticated, the cost of developing and manufacturing new products has increased exponentially. More and more, the costs are concentrated in developing the product—both the product and the most cost-effective process by which to manufacture it—rather than in production, devaluing the labour content in many products and increasing the risk in producing it. MIT geographer Tim Sturgeon points out: "In both manufacturing and service industries, … many companies have been shifting specialized activities out-of-house to an increasingly competent set of suppliers, contract manufacturers, and intermediaries. … While offshore assembly was initially done by the subsidiaries of multinational firms, growing capabilities in the supply-base led to the emergence of independent and highly sophisticated developing country suppliers in places like Taiwan, Korea, and Singapore as well as a cadre of huge 'global suppliers' headquartered mainly in developed countries but with extensive worldwide operations." [24]

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[22] Gary Gereffi, "The Global Economy: Organization, Governance, and Development," chapter 8 in Neil J. Smelser and Richard Swedberg, eds., *The Handbook of Economic Sociology*, 2nd edition (Princeton, NJ: Princeton University Press and Russell Sage Foundation, 2005), p. 166.

[23] Sven W. Arndt and Henryk Kierzkowski note "fragmentation is not a new phenomenon; nor is out-sourcing. … In the modern era, however, both have acquired international dimension and complexity and probably represent one of the most important distinguishing features of contemporary globalization." "Introduction," in Arndt and Kierzkowski, eds., *Fragmentation: New Production Patterns in the World Economy* (Oxford: Oxford University Press, 2001), p. 2.

Li & Fung of Hong Kong is a prime example of a modern specialist in managing the economics of fragmentation and agglomeration. It has access to a network of about 7,500 contract suppliers all over Asia employing as many as 1.5 million workers, providing a critical mediating service bringing brand-name firms together with highly efficient contract manufacturers. Li & Fung takes orders from companies all over the world to "make things" for them, from ballpoint pens and golf clubs to computers and televisions. It in turn finds the right contract manufacturer and organizes the logistics to supply the ordered "thing" to the customer, based on the customer's specifications. Many contract suppliers maintain offices in Hong Kong to liaise with Li & Fung and provide it with product development and engineering information[25].

Firms like Li & Fung are key to understanding the increasing role of China in the value-added chain: the location of choice for "making things." India, on the other hand, has become the favoured place for service inputs. An increasing range of service inputs are being sourced in India, taking advantage of its wealth of IT professionals and English-speaking, well-educated office workers. Its contribution began with low-value-added activities, such as back-office transactions and call centers, but steadily expanded to include software programming, engineering, design, accounting, legal and medical advice, and a broad array of other professional services. "The computerization of work, the advent of the Internet, the standardization and automation of a range of business processes, and the availability of very low-cost, high-speed data networks have made it easier for firms in advanced economies like the United States to connect to the capabilities that exist in developing countries like China, Ireland, Australia, Canada, India, and the Philippines, and this combination of factors appears to be causing a wide range of 'knowledge work' to become more footloose."[26]

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[24] Timothy Sturgeon, *Measuring the Offshoring of Service Work and its Impact on the United States*, accessed at http://web.mit.edu/ipc/owg2005/summary.html.

[25] See Victoria Curzon Price, "Some Causes and Consequences of Fragmentation," in Arndt and Kierzkowski, Fragmentation: *New Production Patterns in the World Economy* (Oxford: Oxford University Press, 2001), p. 96. As its website boasts, "Li & Fung is today one of the premier global consumer-products export trading corporations managing the supply chain for high-volume, time-sensitive consumer goods. Our mission is to deliver the right product at the right price at the right time." www.lifung.com. See also "Manufacturing Survey," *The Economist*, June 20, 1998.

Fragmentation and integration combine to increase the extent and intensity of international transactions, allowing slices of the production process to be moved to the best possible location. The speed and efficiency with which these slices can be integrated clearly have a bearing on the optimal degree of fragmentation. Fragmentation thus allows firms to specialize to a much greater degree and reap greater advantages from economies of scale and scope. Gereffi points out that "today, we live in a world in which deep integration, organized primarily by transnational corporations (TNCs), is pervasive and involves the production of goods and services in cross-border value-adding activities that redefine the kind of production processes contained within national boundaries. … While the postwar international economic order was defined and legitimized by the United States and the other core powers that supported it in terms of the ideology of free trade, it was the way in which transnational corporations linked the production of goods and services in cross-border, value-adding networks that made the global economy in the last half of the twentieth century qualitatively distinct from what preceded it."[27]

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[26] Sturgeon, *Measuring the Offshoring of Service Work and its Impact on the United States*, op. cit.

Systematic data on the extent of this integration is difficult to find, in part because official statistics cannot capture the full value of cross-border service links or the input of services provided through proprietary and other networks, e.g., design, engineering, and marketing, whether done in-house, outsourced locally, or outsourced internationally. Statistical agencies have no way of counting the value of Italian design and German engineering in a toilet ultimately manufactured in Mexico and imported into Canada through a US distribution network. They count the computer on which this is being written as a Chinese import, rather than as the fruit of the design, engineering, and marketing input of the brains at Apple's Cupertino, California campus[28]. The data collected by statistical agencies thus does not always accurately capture the origin of value-added in a complex multi-country production process[29].

From a policy perspective, governments are particularly interested in the intersection of firm-specific value and location-specific value. Firms are now less constrained in their choices of geographic location by distance and policy, and seek to enhance value by dispersing their value-added activities spatially. Governments, in the interest of attracting value-added activity to their location-specific jurisdictions, now compete in promoting policy settings that are congenial to increasingly mobile slices of production by removing barriers and providing positive incentives. In this quest, they are learning that the trade agreements of the past may have been critical to providing the framework of rules that initially promoted fragmentation and integration, but are no longer sufficient.

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[27] Gereffi, "The Global Economy: Organization, Governance, and Development," op. cit., at pp. 163-64.

[28] As Business Week points out, the statistical wizards at national statistical agencies "have no way of tracking the billions of dollars companies spend each year on innovation, product design, brand-building, employee-training, or any of the other intangible investments required to compete in today's global economy." Michael Mandel, et al., "Why the Economy is a Lot Stronger than You Think," *Business Week*, February 13, 2006. The increasing proportion of services in national accounts reflects not only a more prosperous economy with an increasing desire for services rather than goods, but also the disaggregation of production into increasingly smaller slices, many of which are counted as the production of services rather than as part of the goods in which they are embedded, as well as the service links required to bring the spatially separated slices together.

[29] Alexander Yeats, by analyzing data for selected industries and extrapolating the results more widely, estimates that a third or more of world trade is made up of parts and components. "Just How Big is Global Production Sharing?" in Arndt and Kierzkowski, eds., Fragmentation: New Production Patterns in the World Economy (Oxford: Oxford University Press, 2001), pp. 108-143.

Canada-US Cross-Border Integration

The integration that increasingly characterizes the global economy has a longer history at a bilateral Canada-US level. In an earlier era, proximity disposed Canadians to develop a trade and investment dependence on the US market and US capital. The exploitation of Canada's storehouse of raw materials and the establishment of miniature-replica branch plants both developed with heavy doses of US capital. Today, Canada exhibits a high level of both production and consumption dependence on the United States[30]. Its earliest modern manifestation involved the automotive industry. A unique set of circumstances at the time, captured in the Autopact, encouraged the development of integrated, cross-border production[31]. Much of what is now commonplace was pioneered in the auto sector: in-house fragmentation and outsourcing on a continental rather than regional or national basis, followed by out-of-house cross-border fragmentation. The successful introduction of lean, just-in-time production techniques, pioneered in Japan and introduced in North

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[30] For a description of the geography of production in Canada, see Iain Wallace, *A Geography of the Canadian Economy* (Toronto: Oxford University Press, 2002).

[31] On the origins and evolution of the Autopact, see Michael Hart, *A Trading Nation: Canadian Trade Policy from Colonialism to Globalization* (Vancouver: UBC Press, 2002), pp. 240-47.

America in the 1980s, further accelerated this fragmentation process[32].

Since the implementation of the CUSFTA and NAFTA, fragmentation has become commonplace throughout North American industry, involving both manufacturing and service industries[33]. High levels of both two-way intra-industry trade and foreign direct investment indicate continued cross-border integration and rationalization of production between Canada and the United States, as well as a deepening interdependence of manufacturing industries. Canada is the second-leading destination for US foreign direct investment while the United States is the prime destination of Canadian FDI. Proximity of the US and Canadian industrial heartlands, well-developed infrastructures, and transparent legal systems all contribute to the highly integrated nature of the two economies. In turn, this integration contributes to a high level of trade as each country is the other's largest foreign market and leading supplier of imported goods[34].

Discussion of Canadian international economic patterns often focuses on trade in goods and emphasizes exports. A more realistic picture emerges, however, by looking at imports and exports of both goods and services, at inflows and outflows of investment capital, at sales by foreign affiliates, and at exports of goods as a share of domestic shipments. As Howard Lewis and David Richardson point out, "it is becoming increasingly meaningless, if not outright impossible, to think of trade as something separate from cross-border investment, or of exporting as something separate from importing products and innovative ideas. All are tied together in the extended family of global commitment."[35] As such, Canada's involvement in the global economy is much more diversified and the full importance of international exchange becomes clearer. It also makes clear why, as the US economy moves further up the value chain, so does the Canadian economy, increasing trade opportunities for foreign exporters to North American markets and investment opportunities in overseas economies.

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[32] See James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World* (New York: Macmillan, 1990).

[33] For example, the Canadian and US agri-food sectors have become much more integrated. Canadian and US fresh fruit and vegetable consumption is growing and increasingly involves two-way trade, with the direction dependent on the season. Cross-border production by Canadian and US multinational food companies has steadily risen, lowering production costs and giving consumers access to a wider variety of products. See Steven, Zahniser, ed., *NAFTA at 11: The Growing Integration of North American Agriculture* (Washington, USDA Economic Research Service Outlook Report No. WRS0502, February 2005), accessed at www.ers.usda.gov/Publications/WRS0502/ .

[34] See U.S. International Trade Commission, *Production Sharing: Use of U.S. Components and Materials in Foreign Assembly Operations, 1995-1998*, Publication 3265 (Washington, 1999), for a detailed assessment of the extent and nature of cross-border production sharing in the motor vehicle, aircraft, rail locomotives and rolling stock, computer hardware, semiconductor, and telephone equipment industries.

Preliminary figures for 2006[36] indicate that Canadian firms and individuals produced $524 billion in goods and services for export and imported $486 billion in goods and services from all sources. The United States remained by far the most important destination for Canadian merchandise exports at $362 billion (78.9 percent), and the principal supplier of Canadian merchandise imports at $265 billion (65.5 percent). The increasing value of the Canadian dollar relative to the US dollar as a result of rising resource prices appears to have had a larger impact on diversifying merchandise imports rather than exports. China has become the second largest supplier to the Canadian market, while the EU remains the second largest destination for Canadian exports.

On the investment front, Canadian direct investment abroad, with a cumulative book value of $465.1 billion in 2005, continued to outpace the cumulative book value of foreign direct investment in Canada at $415.6 billion[37]. The value of Canadian direct investment abroad exceeded the value of foreign direct holdings in Canada for the first time in 1997 and has remained that way ever since. As a result of increasing cross-border investment, Canadian firms are increasing their presence in the United States through sales by affiliates, particularly in the services sector, just as US-owned affiliates continue to have an important place in the Canadian market place. Analysis of cross-border investment patterns indicates that much of it is trade-enhancing as Canadian and US firms strengthen their position in supply chains and distribution networks while overseas investment is geared more to substituting for trade. McCain's, for example, invests in Europe to process locally sourced inputs while it invests in the United States to enhance its ability to distribute product from its Canadian operations. Canadian firms have become increasingly involved in cross-border mergers and acquisitions, the principal vehicle for FDI flows and for seizing the advantages of deepening integrative trade. From the beginning of 2003 through the first quarter of 2006, Canadian firms acquired more than 1,000 foreign firms, while foreign firms acquired 373 Canadian firms.[38]

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[35] Howard Lewis III and J. David Richardson, *Why Global Commitment Really Matters* (Washington: Institute for International Economics, 2001), p. 11.

[36] Figures from Foreign Affairs and International Trade Canada, http://www.international.gc.ca/eet/balance-payments-en.asp.

[37] Figures from Foreign Affairs and International Trade Canada, http://www.international.gc.ca/eet/foreign-statements-en.asp.

In 2003, the latest year for which such data are available, about 43,310 Canadian-based firms were engaged in exporting. Of these, 27,747 (64.2 percent) exported to the United States alone, 5,802 (13.4) percent) exported only to non-US destinations, and 9,671 (22.4 percent) to both. Fewer than 4 percent of these firms, accounted for more than 80 percent of total exports, and 12 percent accounted for 93.5 percent of Canada's total merchandise exports. The profile of successful exporting firms is also highly skewed toward foreign-controlled firms. Of the 44,469 firms which registered as exporters in 2002, only 3,597 (9 percent) were foreign-controlled, but they were responsible for nearly half of merchandise exports[39].

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[38] Robert Yalden, "Gobble Means Grow," *National Post*, June 28, 2006, p. FP23.

[39] Statistics Canada, *A Profile of Canadian Exporters 1993-2003*, Catalogue No. 65-506-XIE, and Craig Byrd, Foreign Control of Canada's Merchandise Exports, 2002 (Statistics Canada Catalogue No. 65-507-MIE, No. 4)

Similar data are not available on the number of Canadian-controlled exporting establishments with assets or affiliates in foreign markets, particularly the United States, or of the ownership and investment profile of importing establishments, but the data on the dominant position of foreign-controlled exporters suggest that firms active in international markets as traders are also active in those markets as investors. As Lewis and Richardson discovered, internationally engaged firms are more productive and innovative, pay higher wages, and are more profitable, not just in the United States, but in most other economies[40].

Both cross-border and global supply chains today depend critically on relationships that extend well beyond arm's-length transactions between customer and supplier. As US business economist Stephen Blank notes "Ottawa and Washington talk about the world's largest bilateral trading relationship. But we really don't trade with each other, not in the classic sense of one independent company sending finished goods to another. Instead we make stuff together; ... [we] share integrated energy markets; dip into the same capital markets; service the same customers with an array of financial services; use the same roads and railroads to transport jointly made products to market; fly on the same integrated airline networks; and increasingly meet the same or similar standards of professional practice."[41]

Philip Cross and his colleagues at Statistics Canada have done extensive work trying to understand the changing nature of cross-border trade, production, and investment patterns. They have calculated that the import content of Canadian exports has risen steadily over the past two decades. It was 25.5 percent in 1987 and peaked at 33.5 percent in 1998. The rapid rise in trade in the 1990s was in large part the result of rationalization, with imported components replacing domestic components, with the final product exported to a broader market base. More significant than the rise in exports as a share of GDP was the rise in value-added content of exports in GDP, which rose from 21.4 percent in 1987 to reach 28.8 percent in 1999[42]. The recent increase in the value of sales of energy products has had a dampening effect on a further rise in the import content of Canadian exports, but not on their Canadian value-added content.

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[40] Lewis and Richardson, *Why Global Commitment Really Matters*. Op. cit.

[41] Stephen Blank, "It is Time for Canada to Think Carefully about North America." *Embassy*. September 7, 2005.

The extent of the import content of Canadian exports varies considerably from industry to industry. Not surprisingly the auto sector, benefiting from high levels of cross-border ownership since its inception and, since 1965, the impact of the Canada-US Autopact, is by far the most integrated, with the import content of Canadian exports exceeding 50 percent, followed by machinery, equipment, and electronics at over 40 percent, and textiles, other manufacturing, metals, oil refining, and chemicals exceeding 30 percent. Even food, forestry products, and agriculture exceeded 10 percent[43]. Economist Glen Hodgson concludes that "trade has evolved beyond the traditional exporting and importing of goods, and has entered the next generation of trade—integrative trade. Integrative trade is driven by foreign investment and places greater weight on elements like the integration of imports into exports, trade in services and sales from foreign affiliates established through foreign investment."[44] Nowhere has this process of integration been more pronounced than between Canada and the United States.

The rise in Canada's export dependence on the United States in the 1990s was, therefore, to some extent overstated. As a result of double counting, net exports to the United States as a share of GDP only rose to reach 24 percent by 1999, as compared to the 36 percent suggested by the gross numbers[45]. In other ways, however, these numbers may understate the degree of interconnectedness. Canadian merchandise exports as a share of domestic shipments have steadily increased over the past thirty years as Canadian firms have become much more engaged in cross-border and international supply chains. In the 1970s, the value of Canadian merchandise exports was equivalent to about two-thirds of the value-added in the production of goods in Canada. In the opening years of the 21st century, merchandise exports now represent about 125 percent of the value added in the goods-producing sectors of the Canadian economy, indicating nearly a doubling in the export intensity of production in Canada over the past thirty years, as well as the increasing role of imported components in that production[46]. Additionally, as a result of increasing cross-border investment, Canadian firms are increasing their presence in the United States through sales by affiliates, particularly in the services sector, just as US-owned affiliates continue to have an important place in the Canadian market place. Canadian-owned affiliates in the United States rang up $192 billion in sales in 2003[47], roughly 60 percent of the value of Canadian-based exports. In the other direction, US-owned affiliates in Canada reported 2003 sales of $560 billion[48].

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[42] See P. Cross and G. Cameron, "The Importance of Exports to GDP and Jobs," *Canadian Economic Observer*, 12:11 (November 1999) and Cross, "Cyclical Implications of the Rising Import Content in Exports," *Canadian Economic Observer*, 15:12 (December 2002).

[43] See Figure 2 in Cross "Cyclical Implications of the Rising Import Content in Exports."

[44] Glen Hodgson, "Trade in Evolution: the Emergence of Integrative Trade," *EDC Economics*, March 2004, p. 5; http://www.edc.ca/english/docs/030104_integrative_e.pdf. See also Hodgson, "Integrative Trade and the Canadian Experience," *EDC Economics*, May 2004, http://www.edc.ca/english/docs/Canadian_Benefits_050104_e.pdf.

Deepening integration has allowed Canadian industry to become more specialized and has contributed importantly to the growth of value-added sectors. As Industry Canada economist Surendra Gera and his colleagues explain, "while in the past domestic demand was the dominant factor influencing the growth of industries, trade is now becoming much more important. High-knowledge industries in the tradable sector seem to have benefited the most from export performance; low-knowledge industries have seen their relative decline hastened by import competition."[49]

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[45] Cross and Cameron, "The Importance of Exports to GDP and Jobs."

[46] Values derived from Statistics Canada, CANSIM Tables 376-0007, 379-0022, 379-0024, and 380-0012 reporting Gross Domestic Product and Balance of Payments data.

[47] Statistics Canada, "Foreign Affiliate Trade Statistics," *The Daily*, May 25, 2005, at http://www.statcan.ca/Daily/English/050525/d050525f.htm.

[48] US Bureau of Economic Analysis, *U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and Their Foreign Affiliates: Comprehensive financial and operating data*, http://www.bea.gov/bea/ai/iidguide.htm#link12b; US dollar data converted to C$ at Bank of Canada average rate for 2003 of 1.4015.

The changing intensity and composition of bilateral trade have contributed significantly to making Canadians better off both as consumers and as producers. Canadians employed in export-oriented sectors have consistently been better educated and better paid than the national average. As University of Toronto economists Peter Dungan and Steve Murphy report, "Canada is replacing low-productivity employment with high-productivity employment through expanded international trade, and is thereby made better off."[50] Similarly, greater access to internationally competitive goods and services allows Canadians to stretch their earnings further. As Cross and his colleagues point out: "The importance of trade to the economy does not come from an excess of exports over imports; rather, it is from the productivity gains that accrue with increased specialization."[51] Specialization, in turn, increases, as markets expand in response to the increased openness fostered by trade agreements.

Emerging Cross-Border Trade Policy

The relationship with the United States is thus the indispensable foundation of any Canadian policy to maximize benefits from engagement in the global economy. With no other country does Canada have as intense a relationship embracing virtually the whole range of public policy, security, economic development, and human contact. For a growing number of Canadians, the time has come to achieve a seamless border with our neighbour, embraced within a new agreement implementing rules, procedures, and institutions consonant with the reality of ever-deepening, mutually beneficial cross-border integration.

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[49] "The Knowledge-Based Economy: Shifts in Industrial Output," *Industry Canada Working Papers*, Number 15, January 1997, accessed at strategis.ic.gc.ca.

[50] "The Changing Industry and Skill Mix of Canada's International Trade," Industry Canada Research Publications Program, Perspectives on North American Free Trade Series, Paper Number 4, April 1999, available at http://strategis.ic.gc.ca/epic/site/eas-aes.nsf/vwapj/P4-ang.PDF/$FILE/P4-ang.PDF

[51] Cross and Cameron, "The Importance of Exports to GDP and Jobs," p. 3.3.

While some might express horror at any policy explicitly aimed at helping integration, there are no voices calling for the alternative—creating barriers to integration, establishing distance from the United States, and seeking other partnerships to replace this vital relationship. Who would support imposing barriers to the millions of visits that Canadians make to the United States each year, to the annual pilgrimage of several million snowbirds to Florida, Arizona, California, and other sunnier climes, to the thousands of trucks that cross the border every day, to the billions of cross-border phone calls, to the dozens of US TV channels beamed into Canadian homes, to the millions of US books, movies, CDs, and magazines delivered to Canadian homes every year? Who objects to building more cross-border roads, bridges, pipelines, and electrical grids? At a practical level, therefore, the default position is implicitly a gradual deepening of integration, whether stated in those terms or not.

The need for an integrated approach to managing the Canada-US relationship and for the focus upon border management is echoed by the Canadian business community. The Canadian Chamber of Commerce has called for the government to put in place the proper machinery to ensure the cross-border flow of goods and people. The Canadian Association of Manufacturers and Exporters similarly gives priority to improving border efficiency, eliminating border infrastructure bottlenecks, and reducing regulatory barriers to trade. The Canadian Council of Chief Executives argues the need to move beyond border management and reinvent the concept of North American Borders. It, moreover, places the border challenge in the context of reinvigorating the Canada-US defence and security relationship[52].

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[52] See Chamber.ca for proceedings of its 2003 conference and the resolution calling for improved customs procedures. The position of the manufacturers is contained in a joint letter from it and its sister US group,

Canadians and Americans are now trying to come to grips with the fact that their extensive network of trade arrangements has worked exceedingly well, but that they no longer address directly the needs related to the circumstances in which the two countries find themselves. More profoundly, there is a need for new instruments. It is evident that neither the WTO as a body of rules nor the Doha Round of trade negotiations provide a way to address the emerging issues in the relationship in a timely or effective way. The issues are peculiar to the relationship, do not lend themselves to multilateral solutions, and, given the determination of developing countries to shape multilateral negotiating agendas, have no possibility of finding a place even if Canada and the United States were inclined to go down this road.

While a bilateral context offers the chance to shape the agenda and focus uniquely on Canada-US issues, it is far from certain, however, that a conventional new trade agreement, for example, a customs union,[53] would yield results significant enough to justify the investment of political capital necessary to

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the National Association of Manufacturers, to the Prime Minister and President in April 2004, available at cme-mec.ca. See ceocouncil.ca for the Council's publication "New Frontiers: Building a 21st Century Canada US Partnership in North America."

[53] The past few years have witnessed a growing interest in what would be involved in negotiating either a bilateral or trilateral customs union involving Canada, the United States, and perhaps Mexico. We prepared an overview for the Policy Research Initiative, "Policy Implications of a Canada-US Customs Union," PRI North American Linkages Project, February 2005. See also Danielle Goldfarb, "The Road to a Canada-US Customs Union: Step by Step or in a Single Bound," *CD Howe Institute Commentary*, No. 184 (Toronto, 2003); Rolf Mirus and Nataliya Rylska, "Should NAFTA Become a Customs Union?" in Edward D. Chambers and Peter H. Smith, eds., *NAFTA in the New Millennium* (Edmonton: University of Alberta Press, 2002)); Axel Huelsemeyer, "Toward Deeper North American Integration: A Customs Union?" *Canadian American Public Policy*, No. 59 (Orono, ME: University of Maine, October 2004, and Hart "A New Accommodation with the United State: The Trade and Economic Dimension," in Thomas J. Courchene, Donald J. Savoie, and Daniel Schwanen, eds., *Art of the State II: Thinking North America: Prospects and Pathways*, No. 2 (Montreal: Institute for Research on Public Policy, March 2004).

achieve success. A customs union would build on the existing contours of the NAFTA, but extend it to include:

- a single customs territory, allowing for the free circulation of all goods within the customs union.
- a common external tariff (CET) created from merging the two tariff schedules and harmonizing on the lowest current rate of either country, with flexibility to maintain separate external rates over a transition period for a small list of products.
- provisions for sensitive sectors such as clothing (likely transition periods), agriculture (leaving the hardest issues to WTO resolution), culture (similarly leaving aside the principal issues not already covered by the WTO), and recognition of the importance of the energy sector;
- reconciling the differences in the two countries' current free-trade and preferential-trade arrangements with other countries respecting product coverage, rules of origin, and possible future free trade partners.
- a common approach to trade remedy laws that would imply a single regime for third countries, and recognizing that Canada-US cases are rare, concern largely resource products, notably softwood lumber, and point to the need to pay attention to resource management issues.
- a common external trade policy with respect to multilateral and regional negotiations (which, given the degree of policy convergence, should not prove difficult) and more generally for the conduct of trade relations with third countries; with respect to trade sanctions for foreign policy reasons, it should be possible to maintain policy flexibility and devise practical instruments for this purpose without compromising the integrity of the union;
- dispute settlement within the customs union based upon the current NAFTA provisions with, as necessary, some major updating; and
- institutions for administering the union, resolving disputes, and facilitating dynamic, joint policy development to govern accelerating economic integration, drawing upon existing models such as the International Joint Commission.

Each of these would pose technically complex challenges but none would raise insurmountable barriers. The major policy issues inherent in implementing a customs union have essentially been resolved by a process of policy convergence and multilateral and bilateral trade agreements. This conventional approach would, in effect, clean up the leftovers from earlier negotiations but fail to address emerging issues flowing from deepening integration. The advantage of convention is the high level of comfort that Canadians have with the tried and true. The constraint is that the returns from such an approach promise to be minimal. Conventional trade policy provided an appropriate answer to the policy challenges of the past. It provides at best a partial answer to the challenges and problems that flow from the deep integration that now characterizes exchange between Canada and the United States. At its most basic, it would be limited to the exchange of goods, and not address issues related to the exchange of services, capital, or intellectual property rights, and not cover the movement of people.

Canadian trade policy, which in the past has provided answers to the conundrums of the relationship with the United States, is stuck in neutral. During the 2006 election, there was no public discussion of the deep integration that already exists and the broad patterns of cooperation and policy coordination with the United States that have emerged beneath the radar screens of political approval or formal agreement. The logic of Canada's economic interest makes a compelling argument to focus energies upon reinventing the US relationship to conform to modern realities. Yet, time stands still for no policy and unless answers are found to the quandaries of economic integration and the implications that flow from it, Canadians will begin to pay increasingly heavy economic costs from policy paralysis.

Reaping the full benefits of deepening cross-border economic integration will require that Canada and the United States address three fundamental, and interrelated, issues: reducing the impact of the border, accelerating and directing the pace of regulatory convergence, and building the necessary institutional capacity to implement the results of meeting the first two challenges. Each of these will prove difficult and solving the problems associated with either of the first two will prove illusory without addressing the other two.

Border Administration

The first challenge is to address the increasing dysfunctional border administration[54]. The intensity of the cross-border relationship is apparent from the 36,000 trucks and 400,000 people who cross the border every day. Nevertheless, even after 15 years of "free" trade, the Canada-United States border continues to bristle with uniformed and armed officers determined to ensure that commerce and interaction between Canadians and Americans complies with an astonishing array of prohibitions, restrictions, and regulations. The list of rules and regulations for which the border remains a convenient, and even primary, enforcement vehicle has grown, rather than diminished, since the implementation of free trade, particular in response to the new security realities created by 9/11. Administering the physical border imposes high costs on the two governments, on firms and individuals who use the border frequently to conduct their affairs in the integrated North American economy, and on the two economies in terms of opportunities missed to reap the full benefits of deep integration[55]. The result is a not an integrated, single North American market, but two markets with many cross-border ties that remain hostage to the efficiency and reliability of customs clearance, an issue of greater importance to Canadian-based than US-based firms.

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[54] For more detail, see William B. P. Robson and Danielle Goldfarb, "Risky Business: U.S. Border Security and the Threat to Canadian Exports." *C.D. Howe Institute Commentary*, No. 177 (Toronto, March 2005).

[55] Firms in considering fragmentation strategies consider tariff and other border barriers, wage differentials, transport and other integration costs, input costs, government policies, and more. For example, a Canadian firm supplying customers throughout North America, designs and engineers its products in Canada, sources high-end components in the US and Japan, lower-end components in Malaysia and Korea, and contracts for final assembly in China. Product is then shipped to North America for distribution to customers in both Canada and the United States, who rely on local distributors for after-market service. Location of the central distribution facility will in part be determined by the MFN tariff and rules of origin that will apply, and will likely take place in the United States, even if a Canadian location has clear logistic and other cost advantages, because the bulk of product can be distributed on the basis of one customs clearance rather than two. The result is not important to US policy makers but is critical to Canadians.

In addition to routine customs and immigration activities, both Canada and the United States use border controls to interdict illegal immigration, drugs, terrorism, and other criminal activities. Experience, however, suggests that the cost of border administration to pursue these goals is out of proportion to the results[56]. The border is simply too long and too porous to prevent determined cross-border criminal activity. Devoting even more resources at border checkpoints along the bilateral border seems unlikely to achieve additional results absent extraordinary further investments in human and physical infrastructure. Increasing resources to such an extent, however, risks causing considerable collateral damage to economic interests in an effort to find solutions to a problem that can be handled more effectively and efficiently through other initiatives.

To that end, ways need to be found to reduce the impact of the border. The two governments could, for example, strengthen institutional contacts, enhance cooperation, and share information on matters small and large. They could explore further investments in intelligence gathering and gradually focus ever larger parts of that effort at initial entries into North America. They could also make greater investments in infrastructure and in technology (both at ports-of-entry and the corridors leading to such ports). Both types of investments are critical components of any comprehensive effort at improving the management of the border and reducing its commercial impact. Such investments need not proceed on the basis of current inspection methodologies, but could rely much more on risk assessments and random inspections[57]. They could also focus more on targeting resources toward pre-clearance programs for goods, vehicles, and people. Finally, the two governments could enhance discussions about increasing the level of convergence in US and Canadian policies governing such matters as cargo and passenger pre-clearance programs, law enforcement programs of all types, and immigration and refugee determination procedures.

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[56] This, of course, is not a view shared by all; some hold that no cost is too large to protect the country from illegal drugs, immigrants, and other criminal activity. This perspective was well represented by Tim Naumetz, "Summer border policy: take operational risks," *National Post*, 22 July 2003 A2.

[57] To combat terrorism and other illegal activity, for example, Canada and the United States need rapid and timely exchanges of information on

The issues raised in this section, of course, apply largely to problems experienced in the exchange of goods. The cross-border exchange of services takes place to a significant extent without much government notice at the border. Some of it is exchanged electronically; some is eventually embedded in goods; and its extent is difficult to measure. Nevertheless, there are elements of border administration that are pertinent to trade in services, particularly professional services, entertainment services, and similar economic transactions that require the movement across the border of "natural" persons, i.e., real people. The CUSFTA and NAFTA include provisions to facilitate the temporary movement of business people, but these are a far cry from allowing the free movement of labour. Unlike the Schengen Agreement in Europe allowing for the free movement of people throughout the area covered by the arrangement, Canada and the United States still maintain stringent controls on the cross-border travel of each other's residents[58].

Given the extent of cross-border integration, the two governments have taken steps to address border congestion, but

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criminals and other individuals who may pose a security risk. Although there is information sharing at the moment, it may need to be significantly upgraded and some of the information databases need to be combined and made available at the border. Information from law enforcement agencies, immigration agencies, the courts, and other institutions may need to be jointly accessible, at the border, in real time. There is need for much greater collaboration and better information management. Modern database management tools, as well as leading-edge networking software, can be deployed at the border and connected to main databases in Canada and the United States.

[58] See Michael Hart, *Is There Scope for Enhancing the Mobility of Labour Between Canada and the United States?* Paper prepared for Industry Canada, March 2004. Working Paper Series: Working Paper 2004 D-04, available at strategis.ic.gc.ca/epic/internet/ineas-aes.nsf/en/ra01934e.html.

with limited results to date. Efforts to make the border less intrusive and more efficient were integral to the 1996 *Shared Border Accord*, the 1999 *Canada-United States Partnership Forum*, the 2001 *Smart Border Accord*, and now the 2005 *Security and Prosperity Partnership*[59]. These initiatives, however, have been limited by the decision to work within the confines of existing legislative mandates. Furthermore, they assume continued need for current levels of border administration and thus are not aimed at eliminating or limiting the impact of the border, but at making border administration more efficient. Adding this effort to a broader commitment to negotiate a deep integration agreement would provide officials working on this file with the strategic vision they need to move beyond existing legislative mandates and provide them with greater scope to make useful trade-offs among competing priorities. Creating such a framework, investing in infrastructure and in technology (both at ports-of-entry and the corridors leading to such ports), and targeting resources toward pre-clearance programs for goods, vehicles, and people are critical components of any comprehensive effort at improving the management of the border and reducing its commercial impact. Ultimately, in our view, the objective should be to create a border that is considerably more open and less bureaucratic, within a North America that is more secure. If Canadians and Americans want a smarter and less intrusive border between them, they will also need to cooperate to create a more secure perimeter. The result should be a more open, more prosperous, and more secure continent.

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[59] Pressure to be seen to be doing something disposes governments to artfully repackage earlier efforts in order to create new "announceables." Students of this phenomenon would do well, for example, to study the evolution of these four initiatives. Each promised concerted action at the level of the executive branch of government to address a series of border-related problems within existing legislative frameworks. All four shied away from any commitments that might lead to new treaty-level obligations that would require legislative approval. More may not have been politically feasible, but it is unrealistic to expect substantive results without a willingness to invest in more robust projects that might require legislative implementation.

Regulatory Cooperation

A key component to trimming border congestion lies in meeting the second challenge: reducing the impact of regulatory differences between Canada and the United States. As the Canadian Council of Chief Executives points out, "most of the administrative costs and delays at the border come not from the need to assess customs duties, but from myriad rules and regulations that are simply convenient for governments to handle at the border."[60] As Europeans learned, regulatory cooperation and reducing border formalities are two sides of the same coin. There may be a long tradition of pragmatic, informal problem solving between the regulatory authorities of the two federal governments, as well as among provincial and state governments, but the time has come to ask how much regulatory enforcement needs to be exercised at the border and how much can be exercised behind the border. More fundamentally, as regulatory cooperation and convergence proceed, the question becomes whether the two governments are ready to proceed to a more formal, treaty-based process of regulatory cooperation aimed at eliminating to the largest extent possible what has been characterized as the tyranny of small differences. By eliminating those differences, much of the rationale for border administration disappears. As well, it would increase the benefits of deepening integration.

The need to produce multiple versions of the same good, for example, can increase design and production costs, and prevent firms from enjoying the economies of scale that would flow from producing to satisfy a single globally accepted standard. An ever-growing range of goods have to be tested and certified to exacting standards and regulatory requirements before they can be sold. An equally exploding range of services faces onerous and often repetitive qualification and certification requirements. Compliance with different national rules, together with the repetition of redundant testing and certification of products and providers for different markets, raises costs for manufacturers and providers operating in the North American economy. Additionally, complex and lengthy product- or provider-approval procedures can slow down innovation, frustrate new product launches, and operate to protect domestic producers and providers from foreign competitors. For small- or medium-sized firms, the cost of acquiring knowledge of and access to another country's regulatory regime can also effectively dissuade them from attempting to develop that market altogether.

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[60] Canadian Council of Chief Executives, "New Frontiers: Building a 21st Century Canada-United States Partnership in North America." At www.ceocouncil.ca/en/view/?document_id=365&area_id=7.

While well-conceived regulations can be trade promoting and facilitating, regulatory divergence with the United States undermines Canadian competitiveness and results in lost investment. Recent research shows that the benefits of convergence between Canada and the United States are positive and significant. At the same time, Canada's regime, even allowing for important reforms that occurred over the last two decades, imposes significantly heavier burdens on the economy than that of the United States. If the burden of regulation in Canada had been the same as that of the United State, there would have been an average increase of investment in Canada of about US $1 billion annually. If the rate of change in the Canadian regime had been the same as that in the United States, the total investment would have been about $400 million higher resulting in an average of 30 percent more investment annually than the level that occurred. One consequence of such increased investment would have been a 6 percent increase in the research and development share of the GDP[61].

These impacts can be divided into two broad categories: those intended to discriminate in favour of local producers, and those that are the incidental result of regulations aimed at other objectives. The first represents the residual elements of traditional trade liberalization negotiations, and includes such measures as remaining tariffs, government procurement restrictions, trade remedy laws, and similar measures. The second involves a wide range of measures that reflect the increasing complexity of modern economies and the response of governments to demands ranging from consumer protection to environmental stewardship and human rights. The trade and investment effects of the first could continue to be addressed with the traditional approach embedded in trade and investment liberalization agreements; the second would require higher levels of cooperation to identify those regulations that no longer serve any useful public purpose, those that can be implemented and administered on a basis that limits or eliminates the impact of differences, and those where differences are profound and important. Only the latter may need to continue to create any substantive barriers to trade and investment, but on a much more limited basis than is often the case today.

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[61] See Fidele Ndayisenya, "Economic Impacts of Regulatory Convergence Between Canada and the United States." In *Horizons*, 7:1 (June 2004). Canadian Policy Research Initiative.

In the final analysis, however, many of these differences are marginal in their regulatory outcomes, particularly between Canada and the United States, but annoying and even dysfunctional in their economic impact. For companies exporting to multiple markets, the promise of "one standard, one test, accepted everywhere" has become increasingly more attractive[62]. Despite populist notions to the contrary, US regulatory requirements are often more stringent than those in Canada. To take one politically salient example, US responses to environmental degradation, from carbon emissions to water pollution, are often ahead of Canadian efforts. Notes George Hoberg: "as a result of policy integration through emulation, common science and technology, and shared values and politics, environmental policy in Canada and the United States has witnessed a substantial amount of convergence."[63] But, as Nancy Olewiler points out, Canada's "kinder, gentler route to improving the environment … also means that Canada may not be moving as fast as it could toward reaching environmental targets."[64] A coherent program of cross-border cooperation is thus likely to strengthen Canadian regulatory outcomes, even one that will require Canada to do much of the heavy lifting and adjustment.

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[62] The OECD's Philip Wagner indicates how everyone would benefit from achieving this goal: "With harmonised standards and certification procedures, consumers can be confident that products sold throughout the global marketplace meet the same high safety standards everywhere. Manufacturers can avoid costly and unnecessary testing, and their innovative products will gain access to markets more speedily. Regulators can deploy increasingly scarce resources elsewhere, confident that products have been adequately tested and meet exacting requirements." Christopher Wagner, "Safe Products and Global Trade," *The OECD Observer*, No. 202 (October/November 1996), 16.

More to the point, bilateral regulatory convergence is more likely to involve adoption of best practices than reliance on the lowest common denominator. As an Industry Canada survey of Canadian regulators notes: "All of those surveyed indicated that their broad policy objectives were similar to those of their US counterparts. However, many stressed that differences in the respective systems of government and authorizing legislation complicate efforts to cooperate, effectively limiting what can be achieved without significant legislative changes." The same survey also indicated that "most cooperation takes place at the operational level."[65] At the same time, as the survey notes: without an external prod such as a trade negotiation, regulatory cooperation among those operationally responsible quickly grinds to a halt; without the involvement of regulators in the negotiations, however, the required objectives and means may not be well framed, leading to sub-optimal results.

The default option in addressing regulatory convergence between Canada and the United States has been to stay on the very Canadian path that has gradually emerged: cooperation if necessary but not necessarily cooperation. The results have not been uninteresting: Canadian jurisdictions align their regulatory goals and objectives with those of their US counterparts, work with US regulators in many areas, but maintain sufficient regulatory autonomy to chart their own path. The result is two very similar but autonomous regulatory regimes involving extensive duplication and redundancy. The extent of regulatory convergence and cooperation is often influenced by bureaucratic agendas and preferences at the expense of broader goals from economic development to regulatory efficiency. This default position also avoids confronting the two related issues: the border and institutional capacity.

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[63] George Hoberg, "Governing the Environment: Comparing Canada and the United States," in Keith G. Banting, George Hoberg, and Richard Simeon, eds., *Degrees of Freedom: Canada and the United States in a Changing World* (Montreal and Kingston: McGill-Queen's Press, 1997), p. 384.

[64] Nancy Olewiler, "North American Integration and the Environment," in Richard G. Harris, ed., *North American Linkages: Opportunities and Challenges for Canada* (Calgary: University of Calgary Press, 2003), p. 619.

[65] Industry Canada, *North American Regulatory Cooperation*, draft, February 2002, authors' files.

The External Advisory Committee on Smart Regulation (EACSR) appointed by Prime Minister Chrétien concluded that this model was inadequate to address Canada's needs and recommended a proactive approach. It recognized that Canada is "enmeshed in a dense web of international relations," but wondered "whether the government's international regulatory activity is well aligned with national priorities and whether resources are being put to best use." It recommended that "the federal government should work to: achieve compatible standards and regulation in areas that would enhance the efficiency of the Canadian economy and provide high levels of protection for human health and the environment; eliminate small regulatory differences and reduce regulatory impediments to an integrated North American market; move toward single review and approval of products and services for all jurisdictions in North America; and put in place integrated regulatory processes to support key integrated North American industries (e.g., energy, agriculture, food) and provide more effective responses to threats to human and animal health and the environment."[66]

The Committee also recognized two policy traps that continue to appeal to some Canadians:

- Canadians can align their regulations with those in the United States to the extent they collectively judge it to be desirable on their own and do not need to complicate this process by tying it to a bilateral program; and

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[66] External Advisory Committee on Smart Regulation, *Smart Regulation: A Regulatory Strategy for Canada* (Ottawa, Privy Council Office, 2004). At http://epe.lac-bac.gc.ca/100/206/301/pco-bcp/committees/smart_regulation-ef/2006-10-11/www.pco-bcp.gc.ca/smartreg-regint/en/08/rpt_fnl.pdf; pp. 17 & 22.

- Canadians should make a strategic judgment of where they want to be competitive, and then decide whether it is best to achieve that by being the same, being better, or being different.

While there is a superficial appeal to both points, experience suggests a unilateral approach is less likely to yield the desired result: reduce the impact of the border on Canadian trade and investment patterns. This goal will not be achieved in the absence of US confidence that Canada's regulatory regime is substantively equivalent to its own, a confidence that will require its active engagement. The existence of an agreed bilateral program, even one that may require Canada to adapt and adjust much more than the United States, has the additional clear advantage of bringing political pressure to bear on a process that would otherwise become too easily captive of bureaucratic agendas. The prime objective of such a program would not be to promote regulatory convergence for its own sake, but to enhance the performance of the Canadian economy by reducing barriers to reaping the full benefits of North American integration.

The government broadly accepted the recommendations of the EACSR and, in the context of the *Security and Prosperity Partnership* (SPP) adopted by the Presidents of the United States and Mexico and the Prime Minister of Canada in Waco, Texas in March 2005, took important steps to move the agenda along. It appointed a group in the Privy Council Office (PCO)[67] to pursue the path charted by the EACSR. Additionally, the federal government's Policy Research Initiative (PRI) was charged to consider ways and means to implement the EACSR recommendations. In his meeting with the two presidents in April 2006, Prime Minister Stephen Harper confirmed his government's commitment to the continued pursuit of the SPP agenda. What has emerged to date is a commitment to what might be characterized as accelerated incrementalism. The result is a higher level of awareness of regulatory developments in the

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[67] As part of its effort to decentralize decision-making and reduce the PCO to its traditional role of policy coordination, the Harper government assigned work on regulatory reform to Industry Minister Maxime Bernier and his officials.

United States among Canadian policy makers leading to enhanced opportunities to align Canadian regulatory policy with developments in Washington. What is missing is a strong political commitment to regulatory cooperation and a plan to put it into effect. Not surprisingly, the pace in achieving regulatory rationalization has been glacial.

The current Canadian approach also appeals to American regulators, who have to date exhibited little appetite for more. The US decision-making system is extraordinarily resistant to centralized control and thus a very difficult target for more than piecemeal, regulator-to-regulator cooperation. The US President, for example, may appoint the Commissioners to the Securities and Exchange Commission, but once in office, they act fully independently of his direction.

Nevertheless, in both Washington and Ottawa, efforts at regulatory reform and streamlining have gained a growing number of adherents. Congress in 1980 established an Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) and successive presidents have, through Executive Orders, set out the basis for OIRA to provide systematic, centralized review and appraisal of all federal regulations. Much of this effort has been coordinated with broader international initiatives, particularly at the OECD. Canadian efforts parallel those in the United States. Since 1978, Canadian federal regulatory activity has been subject to a constant, comprehensive, centralized process of review, housed initially in the Treasury Board and subsequently in the PCO, with a view to eliminating duplication and redundancy and promoting best international practice. The guiding policies developed in both capitals for rule making and review are remarkably similar in tone and intent and reflect the high level of ongoing discussions at the OECD and bilaterally[68]. A sound foundation has, therefore, been created for a more formal program of cross-border regulatory cooperation and even coordination. To go to the next level, however, the two governments would need to adopt a program leading to an enforceable agreement, and the institutional capacity to make it work[69].

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[68] See, for example, "Government of Canada Regulatory Policy" at http://www.tbs-sct.gc.ca/ri-qr/ra-ar/docs/publications/regulatory_policy_e.pdf and United States. "Economic Analysis of Federal Regulations Under Executive Order 12866." At http://www.whitehouse.gov/omb/inforeg/riaguide.html

Governments must think carefully about any initiatives that may compromise their ability to discharge their responsibility for the security and well-being of their citizens. Canadian experience in negotiating international rules and pursuing regulatory cooperation, both multilaterally and bilaterally, suggests that there is no inherent conflict between these responsibilities and such rule-making and cooperation. Nevertheless, vested interests can mount emotional campaigns questioning the extent to which regulations made jointly with others can respond to Canadian responsibilities. Fortunately, it is not difficult to refute such claims. Canadians, for example, routinely travel in the United States, comfortable in the reliability of US safety regulations. They eat and drink in the United States on the same basis as they do at home. If they are sick, they often can and do rely, at considerable expense, on US medical advice and US-approved drugs. From almost any perspective, Canadians have few if any qualms about the goals and efficacy of US regulations when in the United States. There are few other countries about which Canadians routinely exhibit such confidence. The reason is simple: Canadian and US regulatory regimes are, in almost all respects, closely aligned. The differences are matters of detail that may matter to individual regulators, but have little impact on residents in either country.

Initially, the two governments could build confidence and gain experience at the federal level, but given the federal structure of the two countries, the sooner they engage provincial and state regulatory authorities in a similar process of mandatory information exchange and consultations, the sooner the two countries would arrive at a "North American" approach to meeting their regulatory goals and objectives. Because of the large number of jurisdictions involved, this is an area that would require some creative decision rules as well as institutions to make them work. Fortunately, as at the federal level, extensive regional networks of collaboration already exist between Canadian and US regulators. Any successful federal strategy on economic integration and regulatory convergence would need to both complement and take advantage of these existing cross-border institutions.

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[69] For more detail on what this would involve, see Michael Hart, "Steer or Drift? Taking Charge of Canada-US Regulatory Convergence," *C.D. Howe Institute Commentary*, No. 229 (Toronto, March 2006). This *Commentary* also includes a discussion of the experience in Europe in transforming its customs union into an integrated market.

Institutional Capacity

Integral to any progress in addressing the governance of deepening integration is the need to build sufficient institutional capacity and procedural frameworks to reduce conflict, and provide a more flexible basis for dynamic rule-making and adaptation for the North American market as a whole. It may well be necessary to consign traditional aversion to bilateral institution building to the dustbin and look creatively to the future. While the European model of a complex supranational infrastructure may not suit North American circumstances, there are lessons Canadians and Americans can learn from the EU experience.

The deep integration described above has occurred in the historical absence of an institutional infrastructure for managing this complex, multifaceted relationship. Unlike other bilateral relationships enjoyed by both Canada and the United States, there is no body to provide political or policy oversight of the relationship, no regular meetings between heads of government or foreign or trade ministers, no formal structure of committees looking at the relationship in a coherent and coordinated manner[70]. The absence of formal structure results from a determined and largely successful effort to treat issues in the relationship vertically, rather than horizontally, and to build firewalls to prevent cross linkages. In part, this method of management derives from Canadian fears that, as the smaller partner, Canadian interests would be overwhelmed in any more formal relationship. In part, it originates in the US system of governance that makes coherence and coordination in both foreign and domestic policies extraordinarily difficult to achieve on a sustained basis.

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[70] As former Canadian ambassador to the United States, Allan Gotlieb, observes, "the world's largest bilateral economic relationship [is] managed without the assistance of bilateral institutions and procedures." "A Grand Bargain with the US," *National Post*, 5 March 2003. This paucity of institutions stands in stark contrast with a veritable cornucopia of institutional relationships with the European Union including biannual meetings of the Prime Minister, the President of the European Commission and President (in office) of the Council as well as a host of ministerial committees, official working groups etc. See www.dfait-maeci.gc.ca/canada-europa/mundi/menu-en.asp.

The institutional gap is filled by inspired *ad hocery*. The inter-connected natures of the Canadian and American economies virtually require Canadian and US officials to work closely together to manage and implement a vast array of similar but not identical regulatory regimes from food safety to refugee determinations. Officials and, in some cases, ministers have developed a dense network of informal cooperative arrangements to share information, experience, data, and expertise with a view to improving regulatory outcomes, reducing costs, solving cross-border problems, implementing mutual recognition arrangements, establishing joint testing protocols, and more. On any given day, dozens of US and Canadian officials at federal, provincial, and state levels are working together, visiting, meeting, sharing e-mails, taking phone calls, and more. Virtually all of this activity takes place below the political radar screen. Little of it is coordinated or subject to a coherent overall view of priorities or strategic goals. Some of it is mandated by formal agreements ranging from the NAFTA to less formal memorandums of understanding. More importantly, much of this activity is the natural result of officials with similar responsibilities and shared outlooks seeking support and relationships to pursue them. This activity also reinforces, subtly and indirectly, the deepening integration of the two economies. The NAFTA and similar arrangements mark efforts by governments to catch up with these forces of silent integration and provide appropriate and facilitating governance.

The focus should be upon the functions that need to be performed for the efficient governance of deepening integration, rather than the creation of new institutions where none is needed. To some extent, these could be met by making creative use of existing Canada-US cooperative arrangements, by investing officials in agencies on both sides of the border with new responsibilities, or by building on existing models that have worked well.

The two governments could, for example, stipulate that the Canadian Border Services Agency and the US Customs Service coordinate their efforts to ensure efficient administration of third-country imports. Similarly, an appropriate understanding could be reached requiring the Canadian Department of Transport and the US Department of Transportation to coordinate their efforts to ensure highway safety; before enacting any new rules and regulations, for example, mandatory coordination efforts would focus on ensuring compatible outcomes and mutual recognition of each other's approaches to the same problem. A good basis for this kind of cooperation already exists in both informal networks among officials, and in the relatively minor differences in regulatory approach. What is missing is an agreed mandate to resolve differences and a more formal institutional framework with authority to ensure mutually beneficial outcomes. Establishing a bilateral commission to supervise efforts to establish a more coordinated and convergent set of regulations governing all customs or transportation matters could prove critical to providing the necessary momentum and political will.

In both countries, labour mobility is hampered by provincial and state labour laws and delegated professional accreditation procedures. The NAFTA put in place a modest process to permit temporary entry for business and professional visitors and mutual recognition of professional accreditation. The latter has been hampered by the conflict of interest inherent in a system of self-regulation. As the EU learned, a more centralized approach was required to overcome conflicts of interest and bureaucratic inertia. From architects and accountants to doctors and dentists, there remains considerable scope for enhancing mutual recognition arrangements. An important step toward breaking the logjam would be to appoint a bilateral task force to develop model mutual recognition arrangements for consideration by state and provincial accreditation bodies.

Much can be achieved on the basis of existing networks of cooperation, with the addition as necessary of specific joint or bilateral commissions in instances where existing networks are inadequate. More will be achieved, however, if the two governments commit to the establishment of a limited number of bilateral institutions with a mandate to provide them with the necessary advice and information to effect a more integrated North American approach to regulation. An independent Canada-US Secretariat with a mandate to drive the agenda and report annually to the President and Prime Minister on progress could, for example, prove critical to overcoming bureaucratic inertia. Similarly, a Joint Advisory Board to the President and Prime Minister could contribute some creative drive to the development of new bilateral initiatives. As numerous studies have demonstrated, regulatory agendas are prone to capture, geared to serving the narrow interests of regulator and regulatee. Bilateral initiatives limited to regulatory authorities are unlikely to prove immune from this reality. Regular review by an independent advisory board of progress in implementing a bilateral program of "guided" regulatory convergence could thus prove a valuable addition in keeping the program focused on broader objectives.

The Mexico Question

In concluding the NAFTA in 1993, Canada and the United States opened a new era in their relations with Mexico. The NAFTA stands as testimony to the belief that the North American community involves three nations and that the destiny of all three nations is inextricably intertwined. Broad consensus is in our view emerging, however, that for the moment the Canadian challenge is to elaborate a bilateral rather than a trilateral agenda[71]. Successful implementation of the NAFTA ushered in expectations of closer trilateral relations, but the reality is that the NAFTA provides a common framework of rules to govern two robust and rapidly evolving relationships: between the United States and Canada and between the United States and Mexico. Canada-Mexico relations remain at a much less advanced stage, while the priority issues between Canada and the United States and Mexico and the United States are not of the same order. There are issue areas where there may already be scope for advancing toward trilateral rules and institutions, e.g., surface transportation, while in other issue areas much more will be gained from parallel bilateral efforts, e.g., energy. To that end, the three governments may wish to consider pursuing ways and means to network any bilateral and or efforts and ensure that any success at the bilateral level ultimately feeds into trilateral goals and aspirations[72].

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[71] For some analysts, particularly those with legal training, the NAFTA now constitutes the indispensable foundation from which all future bilateral or trilateral trade and investment negotiations must proceed. Perhaps, but it is also possible to view the NAFTA as an agreement whose time came but is now largely gone. Between Canada and the United States, it is

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now fully implemented. Most of its provisions would be very difficult to undo. Its main continuing importance lies in the dispute settlement provisions set out in chapters 11 and 19; even chapter 20 has been largely superseded by the WTO Dispute Settlement Understanding. We do not mean to suggest that we can now abrogate the NAFTA, but rather that like the 1935 and 1938 Reciprocal Trade Agreements, the 1947 GATT, and the 1965 Autopact, the NAFTA's objectives have been largely realized. Any successor agreement may need to incorporate some of its elements (e.g., chapters 11 and 19), but need not be trilateral. Should Canada and the United States proceed to an agreement that moves well beyond the contours of conventional trade agreements, the precedential value of the NAFTA will be minimal.

[72] In "A Trilateral Mirage: A Tale of Two Americas," a paper prepared for the Canadian Defence and Foreign Affairs Institute in June 2003, Jean Daudelin comes to a less accommodating conclusion: "Canada's bilateral relationship with the United States is vital and its management should not be cluttered by the massive complexity of Mexico-US affairs. … Canada's relations with Mexico … will remain marginal to the country's core interests." Jeffrey Schott, "Prospects for North American Economic Integration: An American Perspective Post-9/11," *Art of the State II: Thinking North America: Prospects and Pathways* (Montreal: Institute for Research on Public Policy, 2004), on the other hand, concludes that US political sensitivities make anything other than a trilateral initiative unrealistic. Discussions with US officials suggest that US political sensitivities are more nuanced, providing scope for differentiated approaches. The difficulties of a trilateral approach that considers both economic and security issues are also well illustrated by the paper prepared for The Art of the State II Conference by Stéphane Roussel and Athanasios Hristoulas,

The Security and Prosperity Partnership of 2005 and renewed in 2006, the official template for the discussion of emerging issues among the three federal governments of North America, specifically recognizes the reality of a "two-speed" approach. Future work on bilateral issues between Canada and the United States, therefore need not become hostage to whether or not Mexico is interested in, or has the capacity to pursue, a specific matter.

The Sovereignty Dimension

Canadian trade policy debates are virtually unique in their elevation of sovereignty as a critical issue of public policy[73]. In the great debates of the past over free trade, notably the elections of 1891, 1911, and 1988, supporters of free trade with the United States found themselves under sustained attack on the grounds that the sacrifice of Canadian sovereignty was too heavy a price to pay. Any new trade negotiations with the United States is certain to revive this old, if increasingly quaint, discussion along a number of fronts.

One argument, advanced by the Senate Foreign Affairs Committee, is that concluding any deeper integration agreement, such as a customs union, would rob Canada of the capacity for setting tariffs on trade with third countries[74]. The reality is that Canada has given up tariff autonomy through the progressive binding of its tariff in the GATT and WTO negotiations as well as the declining utility of the tariff as a policy instrument. A variant on this theme is the claim that a new agreement would prevent the pursuit of distinct industrial, energy,

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"The Quest for trilateral security in North America" (Montreal: Institute for Research in Public Policy, 2003).

[73] With the exception of defence policy issues, where public discussion often veers into dead-end tangents divorced from the iron realities of protecting the two countries from external threats.

[74] Senate Standing Committee on Foreign Affairs, *Uncertain Access: The Consequences of US Security and Trade Actions for Canadian Trade Policy* (June 2003) at parl.gc.ca.

immigration, and environmental policies[75]. This point also lacks substance. The scope for industrial and energy initiatives is already severely constrained by WTO rules on subsidies in the former and by the NAFTA rules in the latter. As regards issues such as immigration and environment, it is far from clear how creating an agreement to enlarge the benefits of economic integration would limit Canadian policy.

A second line of criticism is that a customs union agreement would tightly tether Canadian foreign policy to that of the United States. During the free trade negotiations in the 1980s, critics charged that the United States would threaten Canadian access to its market provided for under the agreement unless Canada embraced US foreign policy goals. Such criticism should be dismissed on a number of grounds. The United States has no modern history of withdrawing from trade agreements or reducing access to its market provided thereunder for foreign policy reasons. Second, the vulnerability of Canada to such a remote probability arises not from the existence of bilateral agreements, but from the deep integration of the two economies, an integration occurring principally because of the natural dynamics of economic integration, driven by the daily economic choices of individuals and firms and fostered by past multilateral and bilateral trade agreements. The only way to mitigate this vulnerability to the United States is to reverse the course of economic integration and accept the incalculable economic costs of such action as a price of insulation from US influence[76].

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[75] For a sample of these views, see Andrew Jackson, "Why the 'Big Idea' is a Bad Idea: A Critical Perspective on Deeper Economic Relations with the United States" (Ottawa: Canadian Centre for Policy Alternatives, 2003). See also Stephen Clarkson, "Time to break free (trade)," *Globe and Mail*, 27 September 2002 and Peter Newman, "Beware of freer trade," *Maclean's*, 2 December 2002. A more thoughtful version of this view can be found in a series of columns by David Crane in the Toronto Star, August 9, 13, and 16, 2003. Support among Canadians for such a defensive attitude toward the United States, however, has steadily declined.

[76] Canadians have demonstrated that they have become increasingly comfortable with their proximity to the United States and with the pragmatic pursuit of better ways to manage deepening integration. See the discussion of

A third criticism is that a customs union would further erode Canada's historical multilateral vocation and undermine Canada's ability to participate in multilateral negotiations.[77] This argument reflects the continuing allure of multilateralism as the central organizing principle of Canadian trade and foreign policy. In fact, an objection to new bilateral arrangements on the grounds of protecting Canada's multilateral heritage is not only historical revisionism, it confuses ends with means[78]. Multilateral rule making and institution building have proven effective means for Canada to pursue its trade objectives but have never impeded the pursuit of trade or foreign policy objectives by other means. Canada has been prepared to look to bilateral rules and institutions when these are available and better suited to achieve the policy objective sought. Both bilateral and multilateral strategies need to be judged on their ability to satisfy Canadian needs and interests. To forego benefits available in a bilateral arrangement in order to uphold the multilateral ideal would make a nullity of coherent policy making.

A fourth criticism is that a deep integration agreement would ignite a "race to the bottom," i.e., to a relentless effort by governments to attract foreign investors and retain domestic investors by reducing regulatory norms and expectations. There is little evidence to support this charge. Indeed, there is a preponderance of evidence pointing in exactly the opposite direction. As societies become more prosperous—one of the most important impacts of globalization and of deepening integration—the demand for regulations to enhance the quality of life increases. The explosion of government regulatory activity to address environmental, human rights, safety, and other issues provides com-

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recent polling in Hart, "A New Accommodation with the United State: The Trade and Economic Dimension."

[77] See, for example, Robert Wolfe, "See You in Washington? A Pluralist Perspective on North American Institutions," IRPP *Choices*, 9:4, at irpp.org.

[78] Brian Tomlin and Bruce Doern, *Faith and Fear: The Free Trade Story* (Toronto: Stoddart, 1991), debunk this cherished myth of Canadian foreign policy elites.

pelling evidence of the gap between rhetoric and reality. In the other direction, the impact of regulatory convergence and regulatory cooperation has been repeatedly to raise the bar by establishing international benchmarks of minimal performance and best international practice. As argued above, bilateral regulatory convergence is more likely to involve adoption of best practices than a lowering of standards to the lowest common denominator.

Conclusions

The Canadian and US economies have become intertwined in response to demands by Canadians and Americans alike for each other's products, services, capital, and ideas, creating jobs and wealth across many sectors and accelerating the forces of mutually beneficial integration. The strategic challenge facing Canadians today is whether they want their government to help or hinder accelerating cross-border economic integration and social and political interaction. Whatever the homilies about the value of independence, there is no sentiment that the government should interfere in private business and investment decisions to change the logic of resources, geography, and private choice that underpin economic integration.

The trade policy of the post-war years, grounded in the theories of well-established international trade theory and pursued on the basis of the politically pragmatic strategy of mercantilist bargaining, proved critical to underwriting the first stages of cross-border integration. The framework of rules and institutions developed over the past seventy years have worked well to facilitate and govern a process of "silent," market-led integration. Both the theory and the practice responded well to the issues that concerned the dominant economic players: large, vertically integrated, multinational companies with operations on both sides of the border focused on the production and exchange of physical goods. While such companies remain important players in North America, the development of much more fragmented production strategies, the ability to disperse production much more widely around the world, the emergence of new security threats, and the reality of a much wider range of cross-border transactions, all point to the need to look at a new set of policy issues that threaten to disrupt the mutually beneficial process of cross-border integration.

The continued presence of a heavily administered border, of similar but differentiated regulatory regimes, and inadequate institutional capacity to solve problems, now undermines the ability of firms and individuals alike to reap the full benefits of deepening cross-border integration. New developments in trade and industrial organization theory help us to understand the nature of new production and exchange patterns and underline the extent to which subtle differences in regulatory regimes and undesirable border complications can frustrate corporate efforts to organize production and exchange as efficiently as possible. In a world where firms have many more choices about what to produce and where, the smaller partner in a deeply integrationist relationship is particularly vulnerable to the impact of border delays and regulatory differences. In these circumstances, the Canadian government is well-advised to invest in efforts that will bring the framework of rules governing cross-border exchange into line with commercial and economic reality.

The Consequent Policy and Research Agenda

Pursuing the policy issues outlined above would be facilitated if analysts, both inside and outside government, developed further some of the ideas set out in this paper and the data and analysis upon which it is based. To that end, we believe further work along the following lines would make a material contribution to informed policy discussion:

- More detailed assessments of the extent of fragmentation and integration involving firms and facilities with cross-border interests in Canada and the United States.
- The extent of investment and other corporate ties linking production in the two countries.
- An inventory of the issues critical to business and investment in making cross-border trade and investment function to its full potential.

- An inventory of the customs and related functions performed at the border that can be performed behind the border, facilitating pre-clearance and similar strategies.
- The relationship of formal border clearance procedures to the interdiction of criminal, terrorist, and other unlawful cross-border activities.
- An inventory of Canadian and US regulatory regimes with serious implications for cross-border trade and investment, and the extent of differences in each of these regimes.
- An inventory of the extent and nature of cross-border networks of decision-makers and an assessment of their effectiveness in addressing cross-border problems.
- An assessment of the European experience in governing deepening integration and the extent of its applicability to North American experience.

We list these as indicative of the range of interesting issues that warrant timely investigation and consideration in building the necessary intellectual capital to address the issues raised in this paper. Other may have additional ideas. What's important is that the analytical and policy communities devote the necessary intellectual resources to thinking through what would be involved in making the North American economy function even better in meeting the needs of Canadians and Americans alike.

Part III

Regional Trade Issues

US–Canadian Trade and US State-Level Production and Employment: An Update

Laura M. Baughman and Joseph Francois[*]

Abstract

Using a computable general equilibrium (CGE) model belonging to the class of multi-region CGE models commonly used to estimate the economy-wide and the sector-specific impacts of trade policy changes, we estimate the impact on US and state output of changes in the US–Canada trading relationship, and their resulting impacts on US jobs. We find that trade with Canada provides tangible and important economy-wide employment and income benefits to the United States and to every US state. Total trade with Canada—of goods and services, and exports as well as imports—generated US output worth $327 billion in 2005, or 2.6 percent of GDP. Output supported by total trade with Canada also support US employment levels. We estimate that trade with Canada supported more than 7.1 million net US jobs, or 4.1 percent of total US employment in 2005. Every US state registered net positive job gains from trade with Canada.

Introduction

Both the United States and Canada have experienced their shares of debates about the costs and benefits of trade. From the Canada–US Free Trade Agreement (CUSFTA) to the North American Free Trade Agreement (NAFTA) to bilateral disputes, the identification of the costs of trade, and particularly the costs of the bilateral trading relationship, seems to overshadow discussion of the benefits of the trading relationship.

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Notwithstanding the history of bilateral trade disputes, the US–Canada trading relationship is clearly a case where both sides benefit in important ways. Bilateral trade between the two neighbours has been growing steadily for decades. The increasingly integrated nature of the two economies—thanks to CUSFTA and NAFTA—now has developed into a generally comfortable integrated relationship. Nevertheless, arguments persist that this integration has cost hundreds of thousands of workers their jobs. Indeed, the jobs debate overshadows the otherwise positive assessment of the impact of increased trade.

With the importance of the trade–jobs question as motivation, in this paper we update and expand on earlier research that quantifies the US employment impact of US–Canada trade. (Francois and Baughman 2004). Our earlier research found that in 2001, cross-border trade (exports and imports) in goods supported 5.2 million US jobs. The current research updates that employment estimate to 2005, and assesses the net job impact in the United States of cross-border services trade[1]. As in our earlier research, we break down the job estimates by state. We begin with an overview of US–Canada trade in goods and services, and then present our estimates of the number of US jobs supported by trade with Canada in 2005. We conclude with a summary of what our results mean for US trade policy. Appendix A details our methodology for estimating the US job impacts of US–Canada goods and services trade.

The US–Canada Trading Relationship

Canada is, not surprisingly, one of the United States' leading trading partners. It is the largest foreign market for US goods, and the largest source—exceeding even China—of US imports. It is the third most important market for US services exports, and the fourth largest source of US services imports (see Table 1, which reports the top ten markets for US exports and imports of goods, and US exports and imports of services).

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[1] Because of the addition of services trade to the modelling exercise, results from the 2001 analysis are not comparable to the results of this analysis.

While clearly much of this tendency to trade with each other is owed to geography, also important has been the success of efforts both countries have undertaken to reduce and eventually eliminate barriers to trade between them. CUSFTA went into effect on 1 January 1989, aiming to eliminate bilateral tariffs and many non-tariff barriers in most sectors of merchandise trade within 10 years. NAFTA replaced CUSFTA on 1 January 1994. By that time, most US–Canada trade was already duty-free thanks to CUSFTA. By 2005, virtually all bilateral trade in goods and services was trade-barrier free.[2]

Table 1: Leading US Trading Partners, 2005
(billions of US dollars)

	Goods		**Services**	
	Exports	**Imports**	**Exports**	**Imports**
Total, World	$894.60	$1,677.40	$360.50	$280.60
Canada	***212.2 (1st)***	***293.3 (1st)***	***32.8 (3rd)***	***22.5 (4th)***
United Kingdom	*37.6*	*50.5*	*45.7 (1st)*	*36.8 (1st)*
Japan	*53.3 (3rd)*	*138*	*42.5 (2nd)*	*23.8 (2nd)*
Mexico	*120.3 (2nd)*	*172.1 (3rd)*	*20.6*	*14.9*
Germany	*33.6*	*84.6*	*20.3*	*25.6 (3rd)*
France	*22.3*	*33.8*	*13.2*	*12.9*
Korea	*27.1*	*43.8*	*11*	7.9
Switzerland	10.7	13	*9.5*	*11.4*
China	*41.8*	*243.5 (2nd)*	*9.1*	*6.5*
Netherlands	*26.3*	14.8	*9.1*	*8.1*
Bermuda	0.5	nil	n.a.	14.1
Taiwan	*22.5*	*34.8*	7.8	6.7
Venezuela	6.4	*34*	*2.6*	0.6

Italics = country is among the top ten for that type of export or import.

n.a. = not available.

Source: US Department of Commerce, Bureau of Economic Analysis

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[2] This is not to suggest that there are no restrictions on bilateral trade. Certain sensitive sectors in both economies continue to face bilateral trade restrictions, while antidumping and countervailing duty actions continue to result in disruption of trade for individual products.

While US goods trade with Canada has been growing over the years, Canada's importance as a trading partner in the post-FTA period has been comparatively stable. In the period 1995–2005, Canada's share of total US exports ranged from 22 to 24 percent, with a modest upward trend over the period. Canada's share of total US imports, on the other hand, declined more or less steadily over the period as lower-cost foreign suppliers, particularly in China, claimed larger shares of the US import market. Canada enjoyed a growing trade surplus with the United States over this 10-year period; however, this increase generally mirrored the total US trade balance, as Canada's share of the total US trade balance has generally averaged about 10 percent.

Table 2: US Goods Trade with Canada, 1995–2005

	Exports	**Imports**	**Balance**
	Value (billions of US dollars)		
1995	$127.4	$146.9	-$19.5
1996	134.3	158.5	-24.3
1997	151.9	170.1	-18.2
1998	156.7	175.8	-19.1
1999	166.7	201.3	-34.6
2000	178.9	233.7	-54.8
2001	163.3	218.7	-55.5
2002	160.9	211.8	-50.9
2003	169.8	224.2	-54.4
2004	190.0	259.0	-69.0
2005	212.2	293.3	-81.1
	Share of Total US (percent)		
1995	22.1	19.6	11.2
1996	21.9	19.7	12.7
1997	22.3	19.4	9.2
1998	23.3	19.2	7.7
1999	24.4	19.5	10.0
2000	23.2	19.1	12.1
2001	22.4	19.1	13.0
2002	23.6	18.2	10.6
2003	23.8	17.8	9.9
2004	23.5	17.6	10.4
2005	23.7	17.5	10.4

Source: US Department of Commerce, Bureau of Economic Analysis

While Canada enjoys a goods trade surplus with the United States, the United States enjoys a services trade surplus with Canada (Table 3). Trends in US services exports and imports with Canada mirror those of goods, but on a much smaller scale. Canada's share of total US services exports has been increasing since 1998, while its share of total US services imports has been declining over that period.

Table 3: US Services Trade with Canada, 1995–2005

	Exports	Imports	Balance
	Value (billions of US dollars)		
1995	$18.1	$11.2	$6.9
1996	19.6	12.6	7.0
1997	20.6	14.0	6.6
1998	19.6	15.3	4.3
1999	22.8	16.4	6.4
2000	24.7	18.0	6.7
2001	24.5	17.5	7.0
2002	25.1	18.0	7.1
2003	27.4	19.5	7.9
2004	29.7	21.1	8.6
2005	32.8	22.5	10.3
	Share of Total US (percent)		
1995	8.2	7.9	8.8
1996	8.2	8.2	8.2
1997	8.0	8.4	8.2
1998	7.5	8.5	7.9
1999	8.1	8.2	8.1
2000	8.3	8.1	8.2
2001	8.6	7.9	8.3
2002	8.6	7.8	8.2
2003	9.1	7.8	8.5
2004	8.6	7.3	8.0
2005	8.6	7.2	8.0

Source: US Department of Commerce, Bureau of Economic Analysis

Overall, US trade with Canada is huge and growing. Total trade (goods plus services, exports plus imports) reached $561 billion in 2005 and reflected average annual increases of 6.5 percent over the previous decade (Table 4). Similarly, total goods trade (exports plus imports) has been growing at an average annual rate of 6.5 percent, and total services trade by even more: 6.7 percent per year.

Table 4: Total* Goods and Services Trade, 1995–2005
(billions of US dollars and percent)

	Total Goods	Total Services	Total Trade	Goods' % Share of Total
1995	$274.3	$29.3	$303.6	90.4
1996	292.8	32.2	325.0	90.1
1997	322.0	34.6	356.5	90.3
1998	332.6	34.9	367.4	90.5
1999	368.0	39.2	407.2	90.4
2000	455.3	42.8	455.3	90.6
2001	424.0	42.0	424.0	90.1
2002	415.8	43.1	415.8	89.6
2003	441.1	46.9	441.1	89.4
2004	499.8	50.8	499.8	89.8
2005	505.5	55.3	560.8	90.1

*Exports plus imports
Source: Bureau of the Census

From a sectoral perspective, many categories of goods show up as both leading exports to and imports from Canada, suggesting co-production between producers in both countries (Table 5). This co-production is most obvious in the case of the motor vehicle sector, where the two countries' auto sectors have been integrated for many years. At the same time, Canada is an important source of raw materials to the US market, most notably petroleum (mineral fuels, which took the lead in 2005). Also important are wood and wood products.

In services trade, transportation-related services exports and imports are roughly comparable in size, although more Canadian passengers travel to the United States than US passengers to Canada. Trade in other private services trade has been the main source of growth in services trade, with US exports to Canada doubling over the period and US imports from Canada rising by a factor of more than 2½. The United States has a significant and growing bilateral surplus in royalties and license fees.

Table 5: Leading Sectors in US Trade with Canada, 1995, 2000, 2005 (billions of US dollars)

Goods Exports	**1995**	**2000**	**2005**
Vehicles (HS 87)	$25.7	$32.8	$40.9
Non-electrical machinery (HS 84)	21.9	30.6	30.9
Electrical machinery (HS 85)	12.8	18.0	13.9
Plastics (HS 39)	4.4	6.9	9.4
Iron and steel (HS 72 & 73)	3.9	5.8	8.7
Mineral fuels (27)	1.4	2.6	8.1
Precision instruments (HS 90)	3.7	5.8	5.3
Paper, paperboard, paper pulp (HS 48)	2.5	3.7	4.3
Organic chemicals (HS 29)	1.6	2.2	3.3
Rubber and rubber products (HS 40)	1.9	2.8	3.0
Goods Imports			
Mineral fuels (HS 27)	$13.6	$31.4	$65.4
Vehicles (HS 87)	40.7	56.1	61.7
Non-electrical machinery (HS 84)	13.4	18.8	19.7
Wood and wood products (HS 44)	7.1	10.8	14.2
Electrical machinery (85)	6.9	16.9	10.8
Plastics and products (HS 39)	3.8	6.7	10.5
Paper, paperboard, paper pulp (HS 48)	9.0	10.1	10.4
Aluminium and aluminium products (76)	3.9	4.5	6.9
Aircraft (HS 88)	1.5	4.7	6.0
Furniture (HS 94)	1.2	5.3	5.8
Services Exports			
Transportation-related services	$9.8	$11.4	$14.6
Travel	*6.2*	*7.2*	*9.0*
Passenger fares	*1.3*	*1.6*	*2.6*
Other transportation	*2.3*	*2.6*	*3.0*
Other private services	6.7	10.7	13.4
Royalties and license fees	1.4	2.8	4.4
Services Imports			
Transportation-related services	$7.1	$10.7	$11.6
Travel	*4.3*	*6.2*	*7.0*
Passenger fares	*0.3*	*0.8*	*0.3*
Other transportation	*2.5*	*3.7*	*4.3*
Other private services	3.7	6.0	9.5
Royalties and license fees	0.2	1.0	0.8

Source: Bureau of the Census

The US–Canada Economic Relationship: What It Means for US Output and Jobs

The economic impacts of trade are one of the biggest concerns of policy-makers on both sides of the border. Polling results suggest that large percentages of the American public believe that trade expansion, and particularly increases in trade deficits, result in domestic job losses. This belief is so longstanding and prevalent that it is widely accepted as fact, and often left unchallenged in political debates.

The data actually support the opposite conclusion: trade (both exports and imports) creates output, which is job-supporting. Because of the role of Canadian inputs in integrated production processes in the United States, increased trade—including increasing imports—contributes to increased domestic output and related jobs. This includes manufacturing jobs.

Our earlier analysis of the US output and job impacts of US–Canada goods trade found that cross-border trade in goods in 2001 supported approximately $162 billion in US economic activity and 5.2 million net jobs (job gains net of job losses). These estimates understated the true value of the US–Canada trading relationship to the United States for two reasons. First, it measured the impact during a recession year, when trade flows were lower than they otherwise would have been had both economies been healthier. Goods trade dropped in 2001 from 2000 levels, and did not recover for several years, until 2004 (see Table 4). Second, the earlier research looked only at the impacts of cross-border trade in goods, rather than goods and services. Given the importance of services to both economies, the output and employment impacts of total trade would necessarily be understated.

In this paper we examine the output and employment impacts of the bilateral trading relationship for a year (2005) that more accurately reflects the robust nature of that relationship, and include total services trade as well. We use the same methodology we followed in our earlier research: a computable general equilibrium (CGE) model that examines the up- and downstream impacts of trade on the US economy.

A Brief Description of the Model

CGE models are commonly used today to estimate the economy-wide and the sector-specific impacts of a trade policy change. A global model in wide use today is the Global Trade Analysis Project (GTAP) model. Working with a version of this model (with the modifications and updates described below), we estimate the impact of US–Canada trade on US production, consumption, trade, prices and welfare.

Briefly, we have updated our core dataset (version 6.2) from 2001 to 2005, and focused on 14 sectors, four regions (the United States, Canada, Mexico, and the rest of the world), and fixed capital: in other words, our analysis is static. The model's structure assumes perfect competition and constant returns to scale. More details are provided in Appendix A. These structural features are appropriate given the current application.

To estimate the impacts on the United States in 2005 of exports and imports of goods and services, we posit the following counterfactual: suppose those exports and imports were simply eliminated as the result of the imposition of a prohibitive tariff on US imports from Canada, and the simultaneous imposition of a prohibitive tariff on Canadian imports from the United States. The losses in US output provide a measure of the opposite: the gains in US output linked to trade.[3] We then take these national estimates (detailed by sector) and distribute them to states according to published sector-specific data for state output. Finally, we compute the jobs related to that output using state- and sector-specific production-to-employment ratios.

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[3] It is important to note that these estimates show what the level of US output and employment would have been in 2005 if US–Canadian bilateral trade were reduced to zero, with the rest of the world continuing and filling in where possible for the lost US–Canada trade. For example, in the counterfactual scenario some US imports of lumber for the housing sector from Canada would have been replaced by imports of lumber from other countries, and the impact would be felt in terms of the higher cost of the alternative sources of inputs. Accordingly, the reported estimates show the gains that the United States makes in jobs and output from being able to trade directly with Canada as well as with the rest of the world. There would, of course, be greater impacts of a full border closure (i.e., one that reduced to zero imports from all trading partners and exports to all trading partners). In addition, a permanent trade-related border closure (simply stopping all trade) can be quite different in effect from one limited temporarily to physical movement of persons and goods (and not, for example, electronic services).

Our approach examines the impact of bilateral trade on US output and employment by accounting for the effects of both total exports and of total imports, rather than simply looking at the impact of net flows (the so-called trade deficit[4]). This approach better permits us to capture the full contribution of trade to the efficiency of US output and to employment. Exports and imports both support jobs directly, jobs tied to manufacturing goods for export, transporting goods (exports as well as imports) to and from ports (and manufacturing the trucks to transport them), warehousing traded goods (and manufacturing the materials used to build the warehouses), financing them, advertising them, etc. In addition, exports and imports make an economy more efficient and that efficiency in turn generates additional indirect output and related jobs. These latter impacts are likely to exceed the direct impacts. But net flows (the trade deficit) only capture a small piece of what creates output and related jobs.

Results

Impact on output of total trade

The impact of US–Canada trade on US national and state output is significant. Table 6 shows that trade with Canada boosted national output by $327 billion, or 2.6 percent of total GDP. Services sector output is heavily linked to trade with Canada. This includes not only services output related to services exports and imports, but also services output related to goods exports and imports (for example, wholesaling and retailing goods exported to or imported from Canada).

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[4] The trade deficit is simply an accounting identity: exports less imports. What matters for evaluating the full impact of trade on any economy is not this net piece of the GDP total, but the impact of total exports and imports directly as well as indirectly on the economy as a whole.

Table 6: US National Output Related to Trade with Canada, 2005 (billions of US dollars)

Total	**$327.0**		
Primary Sectors (agriculture, forestry, fishing, mining)	0.4		
Construction	10.9		
Manufacturing	37.8		
Services	278.0		
Transportation and utilities		*9.2*	
Wholesale and retail trade		*52.3*	
Finance and insurance		*37.7*	
Other services		*178.8*	
Information			*15.8*
Professional and technical			*24.1*
Management			*6.4*
Rental, leasing and real estate			*59.4*
Accommodation and food			*12.7*
Other consumer and public services			*60.3*

Source: authors' estimates

Trade with Canada also accounted for important shares of US state-level output for many states (Table 7). Not surprisingly, the states with the largest populations recorded the largest values of output related to trade with Canada: California, $43 billion (13.3 percent of the national total), Texas, $24 billion (7.3 percent of the total), New York, $26 billion (nearly 8 percent of the total), and Florida, $17 billion (5.1 percent of the total). Together these four states accounted for one-third of total national output related to trade with Canada. States for which trade with Canada accounted for relatively large shares of state output included Indiana, Delaware and Washington (2.9 percent each), and Connecticut, Iowa, Kansas, Michigan, North Carolina, Ohio and Wisconsin (2.8 percent each).

Table 7: State Output Related to Trade with Canada, 2005

(millions of US dollars)

	Value of Output	Share of Total Output	State Share of Total Output Related to Trade		Value of Output	Share of Total Output	State Share of Total Output Related to Trade
Alabama	$4,008	2.64%	1.23%	Montana	$672	2.25%	0.21%
Alaska	646	1.64	0.20	Nebraska	1,765	2.50	0.54
Arizona	5,574	2.57	1.70	Nevada	3,000	2.69	0.92
Arkansas	2,326	2.68	0.71	New Hampshire	1,496	2.72	0.46
California	43,564	2.69	13.32	New Jersey	11,737	2.72	3.59
Colorado	5,412	2.50	1.66	New Mexico	1,487	2.16	0.45
Connecticut	5,387	2.78	1.65	New York	25,697	2.68	7.86
Delaware	1,617	2.86	0.49	North Carolina	9,786	2.82	2.99
D.C.	1,848	2.26	0.57	North Dakota	566	2.32	0.17
Florida	16,946	2.52	5.18	Ohio	12,201	2.77	3.73
Georgia	9,758	2.68	2.98	Oklahoma	2,636	2.17	0.81
Hawaii	1,335	2.47	0.41	Oregon	3,956	2.74	1.21
Idaho	1,222	2.59	0.37	Pennsylvania	12,986	2.66	3.97
Illinois	15,352	2.74	4.70	Rhode Island	1,159	2.65	0.35
Indiana	6,993	2.93	2.14	South Carolina	3,811	2.72	1.17
Iowa	3,186	2.81	0.97	South Dakota	784	2.54	0.24
Kansas	2,710	2.81	0.97	Tennessee	6,142	2.66	1.88
Kentucky	3,696	2.63	1.13	Texas	23,985	2.42	7.34
Louisiana	4,036	2.40	1.23	Utah	2,330	2.57	0.71
Maine	1,152	2.56	0.35	Vermont	598	2.59	0.18
Maryland	6,240	2.53	1.91	Virginia	9,242	2.63	2.83
Massachusetts	8,722	2.68	2.67	Washington	6,943	2.90	2.12
Michigan	10,360	2.75	3.17	West Virginia	1,209	2.28	0.37
Minnesota	6,324	2.70	1.93	Wisconsin	6,047	2.80	1.85
Mississippi	2,088	2.57	0.64	Wyoming	459	1.68	0.14
Missouri	5,788	2.68	1.77	US Total	326,984	2.63	100.0

Source: authors' estimates

Impact of total trade on US jobs

As a result of the boost Canadian trade gives to US output, US jobs are also supported, both directly (in the manufacture of goods or production of services for export, for example) and indirectly (in sectors that get the goods and services out the door and across the border to Canada). Jobs related to importing also span the service sectors, and include jobs related to transporting, wholesaling, warehousing, advertising, financing and retailing products imported from Canada, for example. In addition, it is important to note that producer services are also key inputs to manufacturing, so that goods exports indirectly support services. Our model incorporates the impact of job losses due to import competition; thus the results are net of any negative impacts of imports.

We report our estimates in Table 8. The results indicate that trade with Canada in 2005 supported 7.1 million net direct and indirect American jobs. More than half a million of these jobs are in the manufacturing sector. Services sectors account for the largest share of jobs related to trade with Canada, including such high-wage occupations as finance and insurance, legal, managerial, advertising and other professional services.

Table 8: National Employment Related to Trade with Canada, 2005

Total	**7,111,714**		
Primary Sectors (agriculture, forestry, fishing, mining)	266,746		
Construction	55,464		
Manufacturing	522,864		
Services	6,266,641		
Transportation and utilities		*271,359*	
Wholesale and retail trade		*235,832*	
Finance and insurance		*328,202*	
Other services		*5,431,247*	
Information			*193,433*
Professional and technical			*391,731*
Management			*63,187*
Rental, leasing and real estate			*325,219*
Accommodation and food			*550,104*
Other consumer and public services			*3,907,573*

Source: authors' estimates, based on CGE results discussed in Appendix A

At the state level, every state experiences positive job effects from trade (exports and imports) with Canada (Table 9). The largest absolute net numbers of jobs supported by trade with Canada were in California (832,000), Texas (522,000), New York (469,000) and Florida (405,000). Collectively, across these four states we estimate 2.2 million jobs supported by trade with Canada. For individual states, the job gains are generally in a range of 4 to 5 percent of total state-wide employment.

Table 9: State Employment Related to Trade with Canada, 2005

	Number of Jobs	Share of Total Jobs	State Share of Total Jobs Related to Trade		Number of Jobs	Share of Total Jobs	State Share of Total Jobs Related to Trade
Alabama	100,486	4.00%	1.41%	Montana	24,368	3.97%	0.34%
Alaska	19,332	4.42	0.27	Nebraska	49,697	4.09	0.86
Arizona	128,862	3.98	1.81	Nevada	61,219	4.01	0.92
Arkansas	63,323	4.07	0.89	New Hampshire	32,668	3.91	0.46
California	832,178	4.05	11.70	New Jersey	206,778	4.14	2.91
Colorado	123,794	4.03	1.74	New Mexico	44,418	4.18	0.62
Connecticut	90,192	4.15	1.27	New York	468,703	4.36	6.59
Delaware	21,332	4.04	0.30	North Carolina	208,480	4.08	2.93
D.C.	39,999	5.03	0.56	North Dakota	18,798	3.98	0.26
Florida	404,713	3.99	5.69	Ohio	276,621	4.07	3.89
Georgia	211,676	4.07	2.98	Oklahoma	81,177	3.97	1.16
Hawaii	36,893	4.42	0.52	Oregon	88,649	3.98	1.25
Idaho	33,601	3.87	0.47	Pennsylvania	295,230	4.14	4.15
Illinois	304,514	4.10	4.28	Rhode Island	25,876	4.25	0.36
Indiana	147,794	4.02	2.08	South Carolina	95,329	4.03	1.34
Iowa	77,912	3.96	1.10	South Dakota	21,426	3.98	0.30
Kansas	72,844	4.04	1.02	Tennessee	145,932	4.02	2.05
Kentucky	95,928	4.03	1.35	Texas	521,759	3.99	7.34
Louisiana	101,947	4.14	1.43	Utah	61,309	4.06	0.86
Maine	33,289	4.05	0.47	Vermont	17,410	4.11	0.24
Maryland	140,334	4.22	1.97	Virginia	197,038	4.17	2.77
Massachusetts	172,253	4.19	2.42	Washington	152,914	4.10	2.15
Michigan	221,492	4.02	3.11	West Virginia	36,925	4.06	0.52
Minnesota	141,194	4.03	1.99	Wisconsin	141,404	4.00	1.99
Mississippi	61,759	4.10	0.87	Wyoming	14,095	3.91	0.20
Missouri	144,851	4.05	2.04	US Total	7,111,714	4.08	100.0

Source: authors' estimates

Services sector income and employment

Close inspection of Tables 6 and 8 shows that most of our income and employment estimates are concentrated in services. There are four main reasons that, combined, lead to this outcome. The first is, quite simply, that the US economy is largely a services economy. In 2005, according to data from the US Bureau of Economic Analysis (Department of Commerce), services (including construction) accounted for 83 percent of non-farm private employment and 75 percent of private gross product. Trade with Canada means a more efficient overall US economy, and hence a general increase in economic activity, including services. Any increase in activity and employment will be largely focused on services. Second is that we are modeling direct trade in services. We capture direct linkages between exports to Canada and services production in the United States. Services are an important part of overall trade between the United States and Canada. The third reason is that manufacturing in the United States is actually quite services-intensive (Francois and Woerz 2007), so that a boost to manufacturing activity from exports to Canada has important implications for demand for intermediate services. Fourth, because we are looking at general equilibrium effects, our estimates include income linkages to services demand. This means that higher incomes lead to more demand for (and jobs linked to) consumer services. This last effect is missing from analyses that just focus on production-based input–output linkages.

Impact of changes in trade volumes and costs

Given, then, that trade supports output and jobs, it stands to reason that changes in trade and trade costs would have an impact on output and jobs. Table 10 shows the impact that a 1 percent change in trade volumes or trade costs would have on employment (or output) (referred to as "elasticities"; more detailed estimates are provided in Appendix B).

The trade-volume elasticities can be interpreted as follows. From the first row, a 1 percent increase in trade with Canada supports a 0.038 percent increase in US employment. At the same time, a 1 percent change in trade implies that total income rises by 0.026 percent across the United States. From the values reported in Table B-1 of Appendix B, for California a 1 percent increase in trade implies a 0.037 percent increase in state employment and a 0.027 percent increase in state income.

The trade-cost elasticities in the tables in Appendix B have a similar interpretation. From Table 10, a 1 percent increase in the cost of cross-border trade between the United States and Canada implies a 0.156 percent loss in employment and a 0.103 percent loss of state income. A more detailed set of trade-cost elasticities at the state level is provided in the tables in Appendix B.

Table 10: The Marginal Impact of Changes in Trade Volumes and Costs (Percent)

	Change in total state employment	Change in total Gross State Product
1% increase in trade volumes	0.038%	0.026%
1% increase in cost of trade	-0.156%	-0.103%

Conclusion

In this paper, we have explored the impact of US trade with Canada on the pattern of employment and output across US states. This has been accomplished by using a multi-region, global CGE model to estimate the economy-wide impact of US–Canadian trade. The results of this analysis indicate that the trade relationship between the United States and Canada is a definite net plus for the United States[5]. Accordingly, policies that reduce the flow of goods and services between Canada and the United States result in adverse impacts on jobs and growth in the United States, impacts that are felt in every US state. For example, policy actions that have the effect of reducing US exports of goods or services to Canada would directly reduce US goods and services output, and related jobs. Perhaps less expected by policy-makers is the finding that actions that reduce US imports of goods and services from Canada would also have a negative net impact on US output and related employment. This should not be surprising, given the integrated nature of North American manufacturing industries and the important role of services in these continental industries. The results reported here suggest that these broader impacts should be factored into policy considerations with likely impacts on trade flows.

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[5] We speculate that a similar analysis for Canada would demonstrate parallel benefits to Canadian output and employment.

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Appendix A: Methodology

Different options are available to estimate trade linkages to employment and output. One involves manipulation of input–output tables to map the linkages between exports and/or imports to labour demand and total output across sectors. Such an approach presents several problems, however. The first is that the shares in the base data basically fix the structure of production and demand. Second, there may be double counting, as the net effect of exports and imports is not the simple sum of export effects and import effects. Third, such an approach may also overestimate effects unless the impact of substitution toward trade with the rest of the world is also included.

To address these various issues, we applied a computable multi-sector model of the US economy. Computable general equilibrium (CGE) models are characterized by an input–output structure (based on regional and national input–output and employment tables) that explicitly link industries in a value-added chain from primary goods, over continuously higher stages of intermediate processing, to the final assembling of goods and services for consumption. Inter-sectoral linkages are direct, like the input of steel in the production of transport equipment, and indirect, via intermediate use in other sectors. The model captures these linkages by modelling firms' use of factors of production (labour and capital) and intermediate inputs. The most important aspects of the model can be summarized as follows: it covers all world trade and production, and it includes intermediate linkages between sectors.

Data

Our data come from a number of sources. Data on production and trade are based on national social-accounting data linked through trade flows (see Reinert and Roland-Holst 1997). The input–output structure of our data is drawn from the most recent version of the Global Trade Analysis Project dataset, version 6.2 (Dimaranan and McDougall 2006). In this version of the dataset, the underlying input–output table for the United States is for the year 2004. (Earlier versions of GTAP 6 are based on 1992 input–output tables.) The GTAP version 6.2 dataset itself is benchmarked to 2001 values (where the social-accounting data have been rebalanced based on the input–output coefficients, combined with values of production, wages, and output in 2001, and also 2001 trade values). Because the data are structured to reflect the value flows in the US economy in 2001, we built a modified database that reflects the US and Canadian economies (production and trade) in 2005. Our 2005 database includes detailed national input–output flows (from the GTAP tables combined with 2005 value data), trade, and final demand structures. The basic social-accounting and trade data are supplemented with trade policy data, including additional data on tariffs and non-tariff barriers. The data are further supplemented with data from the US Department of Labor on state-level employment and from the US Bureau of Economic Analysis on state-level output. These data allow us to map nationwide effects to state-level changes in employment and output.

The data on tariffs are taken from the World Trade Organization's integrated database, with supplemental information from the World Bank's recent assessment of detailed pre- and post-Uruguay Round tariff schedules and from the UNCTAD/World Bank WITS dataset. All of this tariff information has been concorded to GTAP model sectors within the version 6.2 database. The sectors in the model are shown in Table A-1. Regions are aggregated into the United States, Canada, Mexico, and rest-of-world.

Table A-1: Model Sectors

Model Sectors	Corresponding GTAP Sectors
1. Agriculture, forestry, and fisheries	1–14
2. Mining	15, 16, 17, 18
3. Utilities	43–45
4. Construction	46
5. Durable goods manufacturing	30,34–42
6. Nondurable goods manufacturing	19–29,31-33
7. Wholesale and retail trade	47
8. Transportation	48, 49, 50
9. Information services	51
10. Finance and insurance	52–53
11. Other business services	54
12. Other consumer services	55
13. Real estate	57
14. Public services	56

The Model

Single representative, composite households comprise each region, with expenditures allocated over personal consumption and savings. The composite household owns endowments of the factors of production and receives income by selling them to firms. It also receives income from tariff revenue and rents accruing from import and export quota licenses (when applicable). Part of the income is distributed as subsidy payments to some sectors, primarily in agriculture.

On the production side, in all sectors, firms employ domestic production factors (capital, labour and land) and intermediate inputs from domestic and foreign sources to produce outputs in the most cost-efficient way that technology allows. Capital stocks are fixed at a national level. Firms are competitive, and employ capital and labour to produce goods and services subject to constant returns to scale[6]. Products from different regions are assumed to be imperfect substitutes in accordance with the so-called Armington assumption. Table A-2 shows the trade elasticities used to model Armington demand for imports[7].

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[6] Compared to dynamic CGE models and models with alternative market structures, the present assumption of constant returns to scale with a fixed capital stock is closest in approach to older studies based on pure input–output modelling of trade and employment linkages. In the present context, it

Table A-2: Substitution Elasticities

		Substitution Elasticities		
		Between competing sources of imports	Between domestic products and imports	Between capital and labour (i.e. value added)
		A	B	C
1.	Agriculture, forestry, fisheries	13.44	6.72	0.20
2.	Mining	5.60	2.80	1.26
3.	Utilities	3.80	1.90	1.40
4.	Construction	7.63	3.82	1.26
5.	Durable goods manufacturing	6.26	3.13	1.22
6.	Nondurable goods manufacturing	3.80	1.90	1.68
7.	Trade	3.80	1.90	1.68
8.	Transportation services	3.80	1.90	1.26
9.	Information services	3.80	1.90	1.26
10.	Finance and insurance	3.80	1.90	1.26
11.	Other business services	3.80	1.90	1.26
12.	Other consumer services	3.80	1.90	1.26
13.	Real estate	3.80	1.90	1.26
14.	Public services	13.44	6.72	0.20

Source: GTAP database, version 6.2

The trade substitution elasticities reported in Table A-2 show the ease with which imports can be substituted for each other (column A), and the ease with which they can be substituted for domestic goods (column B). For example, for durable goods a 1 percent increase in the price of Canadian imports

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can be viewed as generating a lower-bound estimate of effects relative to alternative CGE modelling structures.

[7] Model results depend on the assumptions made concerning the underlying trade elasticities. The elasticities used here are the standard set of elasticities for the Global Trade Analysis Project database. We performed a sensitivity analysis to show the impact of varying these assumptions; the results are shown in Table A-3.

causes a 7.63 percent increase in the ratio of imports of non-Canadian to Canadian-source imports. Similarly, a 1 percent increase in the price of imports of durable goods leads to a 3.82 percent increase in the ratio of domestic to imported consumption. In other words, elasticities quantify the degree to which firms and consumers shift between imports and domestic goods as relative prices change.

We were interested in the impact of trade with Canada on state economies given the current US wage structure. To quantify these linkages, we employ a labour-market closure (equilibrium condition); under this approach, we fix wages at current levels and force employment levels to adjust. This provides a direct estimate of the jobs supported, at current wage levels, by the current level of trade.

Experiments

The experiments conducted with the model involve imposing changes in US–Canada trade. This allows us to trace changes at the border as they work through the US economy. Our experiment involved one change to 2005 trade flows: a shut-down of Canadian goods and services exports to the United States simultaneously with a shutdown in US goods and services exports to Canada[8].

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[8] This is accomplished by making a set of bilateral export taxes endogenous, while making trade quantities exogenous and then reducing them by target amounts, which is appropriate since the relevant question is the benefit of current conditions of trade.

Table A-3: Sensitivity Analysis with Respect to Trade Elasticities: Ranging One Standard Deviation above and below Mean Values

	state employment			gross state product		
	lower	mean	upper	lower	mean	upper
United States	2,948,103	7,111,714	11,275,326	135,548	326,984	518,419
Alabama	41,631	100,486	159,340	1,660	4,008	6,355
Alaska	7,965	19,332	30,698	266	646	1,026
Arizona	53,442	128,862	204,282	2,311	5,574	8,836
Arkansas	26,057	63,323	100,590	957	2,326	3,694
California	345,296	832,178	1,319,060	18,076	43,564	69,052
Colorado	51,275	123,794	196,314	2,242	5,412	8,582
Connecticut	37,558	90,192	142,826	2,243	5,387	8,531
Delaware	8,890	21,332	33,774	674	1,617	2,560
District of Columbia	16,832	39,999	63,165	778	1,848	2,919
Florida	168,169	404,713	641,256	7,042	16,946	26,851
Georgia	87,758	211,676	335,593	4,045	9,758	15,470
Hawaii	15,418	36,893	58,368	558	1,335	2,112
Idaho	13,845	33,601	53,356	503	1,222	1,940
Illinois	126,169	304,514	482,859	6,361	15,352	24,343
Indiana	61,058	147,794	234,530	2,889	6,993	11,096
Iowa	32,140	77,912	123,685	1,314	3,186	5,058
Kansas	30,021	72,844	115,668	1,117	2,710	4,304
Kentucky	39,411	95,928	152,445	1,518	3,696	5,874
Louisiana	42,078	101,947	161,817	1,666	4,036	6,406
Maine	13,868	33,289	52,709	480	1,152	1,825
Maryland	58,576	140,334	222,093	2,605	6,240	9,876
Massachusetts	71,799	172,253	272,707	3,636	8,722	13,808
Michigan	91,792	221,492	351,193	4,293	10,360	16,427
Minnesota	58,496	141,194	223,892	2,620	6,324	10,028
Mississippi	25,523	61,759	97,996	863	2,088	3,313
Missouri	59,997	144,851	229,704	2,397	5,788	9,178
Montana	10,054	24,368	38,682	277	672	1,067
Nebraska	20,494	49,697	78,900	728	1,765	2,802
Nevada	25,377	61,219	97,060	1,244	3,000	4,757
New Hampshire	13,600	32,668	51,736	623	1,496	2,370
New Jersey	85,993	206,778	327,564	4,881	11,737	18,592
New Mexico	18,382	44,418	70,453	616	1,487	2,359
New York	195,849	468,703	741,556	10,738	25,697	40,657
North Carolina	86,632	208,480	330,329	4,067	9,786	15,506
North Dakota	7,735	18,798	29,860	233	566	900
Ohio	114,639	276,621	438,604	5,056	12,201	19,345
Oklahoma	33,569	82,177	130,785	1,077	2,636	4,195
Oregon	36,649	88,649	140,649	1,635	3,956	6,276
Penn- sylvania	122,627	295,230	467,832	5,394	12,986	20,578
Rhode Island	10,807	25,876	40,944	484	1,159	1,835
South Carolina	39,642	95,329	151,015	1,585	3,811	6,036
South Dakota	8,865	21,426	33,987	324	784	1,243
Tennessee	60,248	145,932	231,616	2,536	6,142	9,749
Texas	214,502	521,759	829,016	9,860	23,985	38,109
Utah	25,392	61,309	97,226	965	2,330	3,696
Vermont	7,248	17,410	27,572	249	598	948
Virginia	81,904	197,038	312,172	3,842	9,242	14,643
Washington	63,483	152,914	242,345	2,882	6,943	11,003
West Virginia	15,175	36,925	58,676	497	1,209	1,921
Wisconsin	58,465	141,404	224,344	2,500	6,047	9,594
Wyoming	5,670	14,095	22,521	185	459	733

Based on Gaussian quadrature, where standard error=0.5*elasticity and where nesting is imposed so that the lower-level Armington elasticity = ½ the upper-level Armington elasticity. Given the actual uncertainty surrounding GTAP trade elasticities, we have overestimated the confidence bounds.

Appendix B: Marginal Impact of Trade on Jobs and GSP: Elasticities Analysis

The first two columns in Table B-1 at the end of this Appendix B provide estimates of the marginal impact of trade on state-level employment and gross state product (GSP). Technically, the numbers in the table are elasticities. This means that they measure the percentage change in employment (or GSP) associated with a 1 percent change in trade. The output and employment elasticities are defined as follows:

$$\text{Output elasticity} = \%\Delta\text{GSP} \,/\, \%\Delta\text{Trade} \tag{1}$$

$$\text{Employment elasticity} = \%\Delta\text{Employment} \,/\, \%\Delta\text{Trade} \tag{2}$$

Columns 2 and 3 in Table B1 report the results. For total US GSP across all states, the output elasticity is 0.026 (top row, column 3). This means that a 10 percent drop in trade maps to a 10%*0.026=0.26 percent drop in total state GSP. For a full closure of trade, the value is approximately 100%*0.026=2.6%. From Table 6 of the main text, our exact estimate is 2.63%, approximated by the value implied by the elasticity in the Table B-1. The same relationships hold with all values in Tables B-1, B-2 and B-3.

Similarly, for total US employment across all states, the employment elasticity is 0.038 (top row, column 2). This implies that a 10 percent increase (or reduction) in trade would imply a 0.38 percent increase (or drop) in US jobs.

The state-level impacts are interpreted in a similar fashion. Thus, for California, a 1 percent increase in trade implies a 0.037 percent increase in state employment and a 0.027 percent increase in state income.

Columns 4 and 5 of Table B-1 focus on a different aspect of the same issue. They also report elasticities. However, these involve changes in state employment and GSP that result from a 1 percent increase in trade costs (the cost of delivering goods across the border, measured as a share of the price of goods and services traded.) From the table, a 1 percent increase in the cost of trade implies a 0.156 percent drop in US employment and a 0.103 percent drop in incomes at the state level. Choosing California again as an example, this means that an increase in border costs equal to 1 percent (10 percent) of the price of traded goods and services implies a 0.155 percent (1.55 percent) drop in state employment in California and a 0.104 percent (1.04 percent) drop in state income.

Table B-2 provides a state breakdown for employment by broad sectors. The values in the table are again elasticities. However, this time they are reported for primary, manufacturing, and service sector employment linked to the level of trade with Canada.

Finally, Table B-3 provides a breakdown for state-level GSP by broad sectors.

Table B-1: State Employment and GSP Elasticities: Trade with Canada

	% impact of 1% change in trade volumes		% impact of 1% change in cost of trade	
	jobs	GSP	jobs	GSP
United States	0.038	0.026	-0.156	-0.103
Alabama	0.037	0.026	-0.154	-0.103
Alaska	0.041	0.017	-0.170	-0.062
Arizona	0.037	0.026	-0.152	-0.099
Arkansas	0.038	0.026	-0.156	-0.105
California	0.037	0.027	-0.155	-0.104
Colorado	0.037	0.026	-0.154	-0.096
Connecticut	0.038	0.028	-0.159	-0.109
Delaware	0.037	0.028	-0.155	-0.113
District of Columbia	0.047	0.024	-0.194	-0.086
Florida	0.037	0.026	-0.153	-0.097
Georgia	0.038	0.027	-0.156	-0.106
Hawaii	0.041	0.026	-0.169	-0.095
Idaho	0.036	0.026	-0.148	-0.099
Illinois	0.038	0.027	-0.157	-0.107
Indiana	0.037	0.028	-0.154	-0.115
Iowa	0.037	0.027	-0.151	-0.110
Kansas	0.038	0.026	-0.155	-0.099
Kentucky	0.038	0.026	-0.154	-0.103
Louisiana	0.038	0.024	-0.159	-0.096
Maine	0.038	0.026	-0.155	-0.100
Maryland	0.039	0.026	-0.162	-0.099
Massachusetts	0.039	0.027	-0.161	-0.104
Michigan	0.037	0.027	-0.154	-0.106
Minnesota	0.038	0.027	-0.154	-0.105
Mississippi	0.038	0.026	-0.157	-0.100
Missouri	0.038	0.027	-0.155	-0.105
Montana	0.037	0.023	-0.152	-0.086
Nebraska	0.038	0.025	-0.156	-0.097
Nevada	0.036	0.028	-0.153	-0.103
New Hampshire	0.036	0.027	-0.150	-0.106
New Jersey	0.038	0.027	-0.159	-0.108
New Mexico	0.039	0.022	-0.160	-0.082
New York	0.040	0.027	-0.167	-0.105
North Carolina	0.038	0.028	-0.157	-0.113
North Dakota	0.037	0.023	-0.152	-0.089
Ohio	0.038	0.027	-0.156	-0.108
Oklahoma	0.037	0.022	-0.152	-0.084
Oregon	0.037	0.027	-0.152	-0.105
Penn- sylvania	0.038	0.026	-0.159	-0.105
Rhode Island	0.039	0.026	-0.163	-0.103
South Carolina	0.037	0.027	-0.155	-0.107
South Dakota	0.037	0.025	-0.152	-0.097
Tennessee	0.037	0.026	-0.154	-0.105
Texas	0.037	0.024	-0.152	-0.095
Utah	0.038	0.026	-0.155	-0.099
Vermont	0.038	0.026	-0.157	-0.100
Virginia	0.038	0.027	-0.160	-0.103
Washington	0.038	0.026	-0.157	-0.100
West Virginia	0.038	0.023	-0.156	-0.089
Wisconsin	0.037	0.027	-0.153	-0.110
Wyoming	0.036	0.018	-0.149	-0.064

Note: all elasticities are significant at the 5% level, based on Gaussian quadrature sensitivity analysis of estimates with respect to uncertainty about values of trade elasticities

Table B-2: Detailed State Employment Elasticities: Trade with Canada

	% impact of a 1% change in trade volumes on employment		
	primary	manufacturing	services
United States	0.043	0.034	0.039
Alabama	0.050	0.034	0.038
Alaska	0.011	0.038	0.043
Arizona	0.028	0.032	0.037
Arkansas	0.061	0.035	0.040
California	0.036	0.034	0.038
Colorado	0.029	0.033	0.038
Connecticut	0.054	0.033	0.039
Delaware	0.066	0.036	0.038
District of Columbia	0.019	0.037	0.047
Florida	0.034	0.033	0.037
Georgia	0.054	0.035	0.038
Hawaii	0.069	0.037	0.041
Idaho	0.058	0.034	0.038
Illinois	0.070	0.034	0.039
Indiana	0.091	0.033	0.039
Iowa	0.155	0.034	0.039
Kansas	0.059	0.034	0.040
Kentucky	0.059	0.034	0.040
Louisiana	0.015	0.035	0.040
Maine	0.031	0.035	0.039
Maryland	0.047	0.035	0.039
Massachusetts	0.028	0.033	0.039
Michigan	0.060	0.032	0.038
Minnesota	0.109	0.034	0.039
Mississippi	0.052	0.033	0.040
Missouri	0.128	0.034	0.039
Montana	0.048	0.034	0.039
Nebraska	0.125	0.035	0.040
Nevada	0.009	0.033	0.037
New Hampshire	0.038	0.032	0.037
New Jersey	0.050	0.036	0.039
New Mexico	0.022	0.033	0.040
New York	0.047	0.034	0.041
North Carolina	0.061	0.035	0.039
North Dakota	0.088	0.033	0.040
Ohio	0.066	0.033	0.039
Oklahoma	0.029	0.033	0.040
Oregon	0.053	0.033	0.039
Pennsylvania	0.043	0.034	0.039
Rhode Island	0.025	0.033	0.040
South Carolina	0.057	0.035	0.038
South Dakota	0.147	0.033	0.039
Tennessee	0.130	0.034	0.039
Texas	0.022	0.034	0.038
Utah	0.035	0.033	0.039
Vermont	0.056	0.033	0.039
Virginia	0.056	0.034	0.039
Washington	0.044	0.033	0.039
West Virginia	0.015	0.034	0.040
Wisconsin	0.119	0.034	0.039
Wyoming	0.010	0.034	0.040

Table B-3: Detailed GSP Elasticities: Trade with Canada

	% impact of a 1% change in trade volumes on GSP		
	primary	manufacturing	services
United States	0.004	0.020	0.025
Alabama	0.005	0.020	0.024
Alaska	0.000	0.020	0.023
Arizona	0.005	0.020	0.025
Arkansas	0.007	0.020	0.024
California	0.007	0.020	0.026
Colorado	0.002	0.020	0.026
Connecticut	0.008	0.020	0.026
Delaware	0.010	0.020	0.027
District of Columbia	0.005	0.020	0.023
Florida	0.009	0.020	0.025
Georgia	0.007	0.020	0.025
Hawaii	0.009	0.020	0.025
Idaho	0.009	0.020	0.025
Illinois	0.006	0.020	0.025
Indiana	0.006	0.020	0.024
Iowa	0.009	0.020	0.024
Kansas	0.006	0.020	0.024
Kentucky	0.004	0.020	0.023
Louisiana	0.001	0.020	0.024
Maine	0.010	0.020	0.024
Maryland	0.007	0.020	0.025
Massachusetts	0.008	0.020	0.025
Michigan	0.007	0.020	0.025
Minnesota	0.008	0.020	0.025
Mississippi	0.005	0.020	0.024
Missouri	0.007	0.020	0.025
Montana	0.005	0.020	0.024
Nebraska	0.010	0.020	0.024
Nevada	0.001	0.020	0.028
New Hampshire	0.008	0.020	0.026
New Jersey	0.007	0.020	0.026
New Mexico	0.001	0.020	0.024
New York	0.007	0.020	0.026
North Carolina	0.009	0.020	0.025
North Dakota	0.006	0.020	0.024
Ohio	0.005	0.020	0.024
Oklahoma	0.001	0.020	0.024
Oregon	0.010	0.020	0.025
Pennsylvania	0.004	0.020	0.024
Rhode Island	0.008	0.020	0.025
South Carolina	0.008	0.020	0.024
South Dakota	0.009	0.020	0.025
Tennessee	0.007	0.020	0.024
Texas	0.001	0.020	0.025
Utah	0.002	0.020	0.025
Vermont	0.008	0.020	0.024
Virginia	0.005	0.020	0.025
Washington	0.010	0.020	0.025
West Virginia	0.001	0.020	0.023
Wisconsin	0.009	0.020	0.024
Wyoming	0.000	0.020	0.025

The Canadian Automotive Market

Johannes Van Biesebroeck[*]

Executive summary

The automotive sector is Canada's largest manufacturing sector, accounting for 12% of its manufacturing GDP and 25% of its manufacturing trade. The principal objective of this study is to calculate the impact of changes in Canada's trade policy on the automotive sector. The study is organized in five sections: the first identifies current and future trends in the industry; the second contains an econometric model to analyse the market effects of four trade policy scenarios on automobile production; the third identifies the impact of trade policy on foreign direct investment; the fourth contains an analysis of the market effects of trade policy changes on the aftermarket auto parts sector; and the last section of the study discusses the future direction of the automotive industry.

Current and Future Trends in the Industry

Despite record sales in North America over the past few years, the long-term trend for the automotive industry is weighted towards higher growth rates in less developed economies, particularly China, Korea, Mexico, Brazil, India and Thailand. While global production increased by a factor of six between 1950 and 2004, combined production in Canada and the United States less than doubled over the same time period. Even though Canadian exports of finished vehicles remain very strong, a concern is the reliance on the U.S. market. From a policy perspective, there is little Canada can do about this. The export potential for vehicles produced in Canada is effectively driven by the type of vehicles foreign-owned manufacturers decide to produce in their Canadian assembly plants.

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[*] University of Toronto. This paper is an independent study commissioned by the Government of Canada regarding the impact of changes in Canada's trade policy on the automotive sector. It was published online October 20, 2006 at http://www.dfait-maeci.gc.ca/tna-nac/RB/cam-en.asp. The views expressed in this study are those of the author only. They do not necessarily reflect those of the Government of Canada and may not be attributed to it.

The larger growth area for the Canadian automotive industry in recent decades has been in parts and components which, by 2002, had reached 66% of total automotive employment, up from 55% in 1991. Exports of automotive parts, while also very concentrated on the United States, are slightly more diversified than is the case for vehicles.

Market Analysis: Automobile Production

The Model

The econometric analysis of the impact of trade policy on the vehicle assembly sector was conducted in three steps. First, a nested logit model was used to estimate demand at the vehicle level based on seven nests. This model selection results in higher elasticities of substitution between models in the same segment than across segments. Second, the demand model was used to calculate a number of quantities that influence the effect of policy changes including: (i) own and cross-price elasticities for each model with respect to all other models in the market; (ii) unobserved vehicle quality, from the point of view of the consumer; and (iii) the marginal costs for each vehicle that are consistent with the estimated price elasticities of demand and the observed prices. To calculate the elasticities and marginal costs, it is assumed that firms are playing a Bertrand price-setting game (i.e., a specific form of game theory) in differentiated products. Third, using the estimated demand parameters, price-elasticities and marginal costs, simulations of market equilibrium are conducted to examine the impact of elimination of Canada's 6.1% import tariff on non-NAFTA vehicles.

There are four trade policy changes simulated using this model: (i) an FTA with South Korea; (ii) an FTA with Japan; (iii) an FTA with the European Union (E.U.); and (iv) unilateral abolition of the Canadian tariff on imported vehicles. An FTA is assumed to include the elimination of tariffs on imports from the partner country.

An FTA with Korea: The results of the model's application to elimination of tariffs with Korea is a decrease in average prices, an increase in average mark-ups for Korean firms and a slight decrease for foreign firms, and an increase in aggregate vehicle sales. In the end, Korean imports are estimated to increase by 9.72%, while all other foreign suppliers lose. As well, production in Canada declines by 0.53%.

An FTA with Japan: While the analysis of an FTA with Japan is similar to that of an FTA with Korea, one notable difference is that, due to compositional effects, i.e., sales shifting upmarket as prices decrease, the average sales-weighted Japanese price ends up higher with an FTA. Another is that the largest effect of this FTA would be a 3.14% decrease in imports from the E.U. because they compete with Japan-made cars in all luxury segments. In the end, Japanese imports are estimated to increase by 15.11%, while production in Canada falls by 0.94%.

An FTA with the E.U.: Due to the higher demand elasticities of the median European car in every segment, an FTA with the E.U. brings even stronger compositional effects than an FTA with Japan. In this scenario, the average price is estimated to increase as the generally expensive European vehicles gain market share. The increase in imports from the E.U. is estimated at 28.32%, while Canadian production is estimated to decrease by 0.74%.

Unilateral Tariff Elimination: Under unilateral tariff elimination by Canada, Canadian production is estimated to decline by 8,668 units annually (2.16%). While this is not nearly enough to noticeably impact assembly plant capacity decisions, no doubt employment would be affected, including in supplier plants, and some workers would face transition costs. In addition, while Korea, Japan and the E.U. all benefit under this scenario, the import gains go disproportionately to the E.U., which sees its imports increase by almost 24.53% versus only 7.68% for Korea.

As demonstrated in the following table, there are increases in consumer surplus that would accrue in each of the above scenarios. However, overall domestic welfare is estimated to decrease marginally in each case. This is mainly due to the large decreases in government tariff revenues.

	FTA with:			Unilateral Tariff Elimination
	Korea	Japan	E.U.	
Aggregate effects on:				
Price (average)	-0.35%	-0.27%	0.95%	0.30%
Demand	0.25%	0.53%	0.45%	1.22%
Canadian production[1]	-0.53%	-0.94%	-0.74%	-2.16%
Imports	0.52%	1.04%	0.86%	2.37%
Consumer surplus	0.28%	0.60%	0.51%	1.37%
Tariff revenue	-21.83%	-44.84%	-36.62%	-100.00%
Domestic welfare	-0.04%	-0.04%	-0.02%	-0.08%

[1] refers only to Canadian production of vehicles sold in Canada

Foreign Direct Investment

While a tariff on final vehicle imports provides incentives for foreign firms to establish local production capacity to avoid the tariff, current tariff levels are sufficiently low and the overcapacity in the market sufficiently large such that no significant investment impact would be expected from any of the scenarios analysed in section two. In addition, the probability that any firm will expand assembly capacity in North America beyond the currently announced plans is relatively small. In terms of potential expansion of Canadian exports of finished vehicles, this is also small. Large export volumes from Canada to the rest of the world also seems an unlikely proposition, in part due to likely increases in exports from low wage countries, only a marginal phenomenon for the moment.

Market Analysis: Aftermarket Auto Parts

In order to assess the impact of trade policy changes on the more diverse parts and components sector, a number of methodologies are used to estimate demand and supply elasticities. Simulations are then conducted to examine the impact on Canadian exports in the event of FTAs with China, South Korea and the E.U. The estimated changes in Canadian exports of automotive parts range from 10.4% to 22.2% for an FTA with China; 8.4% to 11.6% for an FTA with South Korea; and 3.4% to 7.9% for an FTA with the E.U. in view of the fact that current trade protection for the parts sector in Canada is very low. If giving up the limited protection that exists would result in lower overseas trade barriers (which tend to be higher), the net effect would likely be positive.

Future Directions and Concluding Comments

There are many factors that are likely to affect the future direction of the automotive industry in Canada, including: the types of fuels that cars will be using; whether current trends towards keeping manufacturing close to the location of the final customer remain constant; future sales volumes in North America; the location of research and development; and government policy. However, among the limited areas where government intervention may have an effect on the automotive sector, intervention in the area of trade policy is likely to have a more limited net effect on welfare than alternatives such as investment, research and development, and infrastructure support.

The study concludes that changes to Canada's trade policy would have a minimal net impact on Canada as a whole. In particular, while elimination of Canada's automotive tariff may have a modest impact on Canadian production, these losses are expected to be offset by consumer gains.

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1. Current and future trends

This section analyzes and documents current trends in global production and trade in the auto industry, examines Canada's position (competitiveness and technology leadership) in the global and North American auto markets, and identifies emerging trends and issues in the industry that require policy-makers' attention.

1.1 Canada's automobile industry

1.1.1 Current situation

Even though the automotive industry in North America is going from one bumper sales year to the next, the long-term trend for the industry is weighted towards higher growth rates in less developed economies. Figure 1A plots the cumulative global production of cars and light trucks, split by region. While global production increased by a factor of six between 1950 and 2004, combined production in Canada and the United States less than doubled over the same time period: average production between 1990 and 2000 was approximately 50% higher than between 1950 and 1960. In 2004, the last year of data in Figure 1.1A, production in Canada and the United States stood at 14.7 million vehicles, approximately the same as the average for the latter half of the 1990s and approximately equal to the combined output of all non-traditional producers (the rest of the world minus North America, Europe, and Japan).

The same production statistics for each region are plotted in Figure 1.1B as a fraction of global output. The declining relative importance of Canada and the United States is put in stark perspective. While these two countries accounted for almost 80% of world output in 1950, this declined to 24% in 1980. The subsequent establishment of North American assembly plants by foreign producers stabilized, even increased slightly for a while, the North American share of world output, which currently stands at 23%[1].

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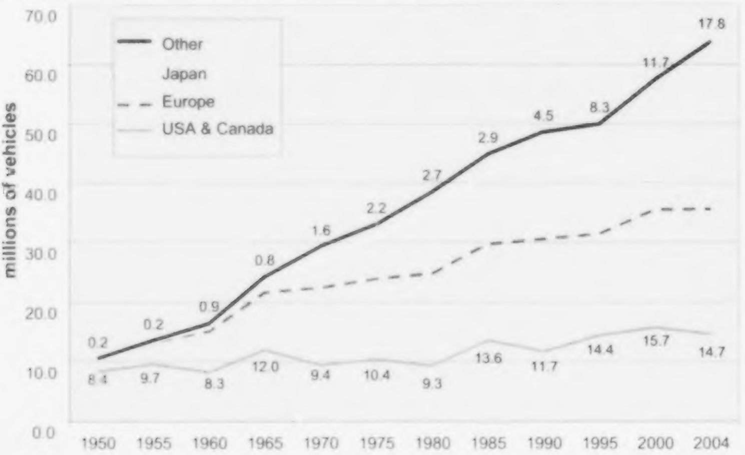
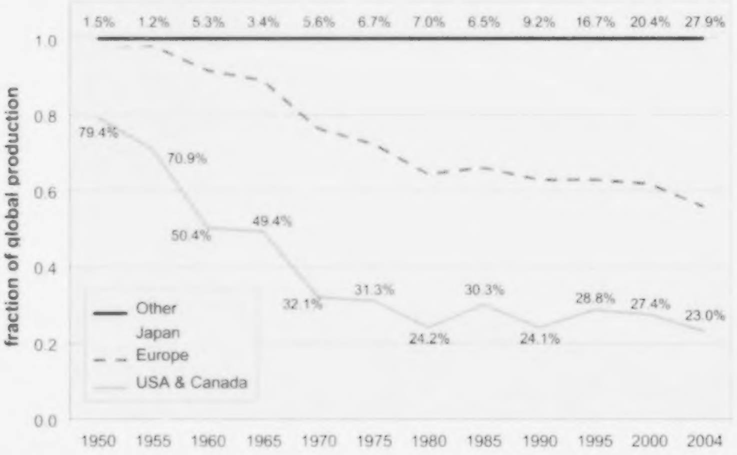
[1] Note that the higher average value of vehicles produced in North America gives the region a higher relative weight in value terms.

Figure 1.1A: Light vehicle production by region (million vehicles)



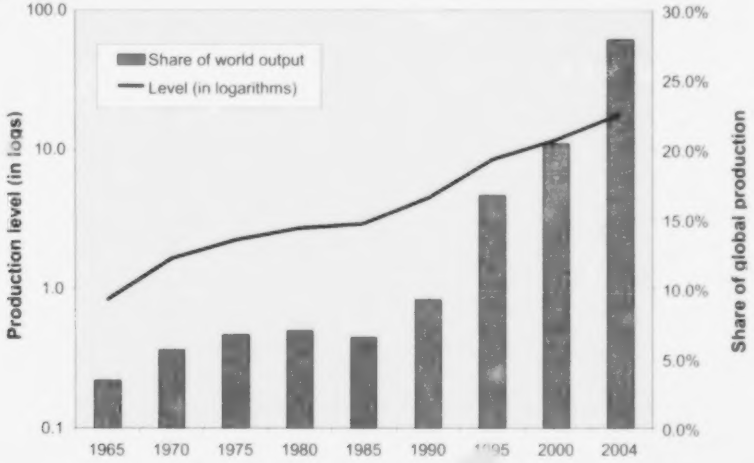
Source: Ward's World Motor Vehicle Data Book (2005)

Figure 1.1B: Light vehicle production by region (fraction of worldwide total)



Source: Ward's World Motor Vehicle Data Book (2005)

Figure 1.1C: Light vehicle production by non-traditional producers (countries)



Source: Ward's World Motor Vehicle Data Book [illegible]05)

In the first 15 years after World War II, the fastest growth took place in Europe, which quickly doubled its share in world production. Subsequently, its relative importance declined somewhat, but the decline was cushioned by the more recent rise of Eastern Europe as a lower-cost manufacturing base.

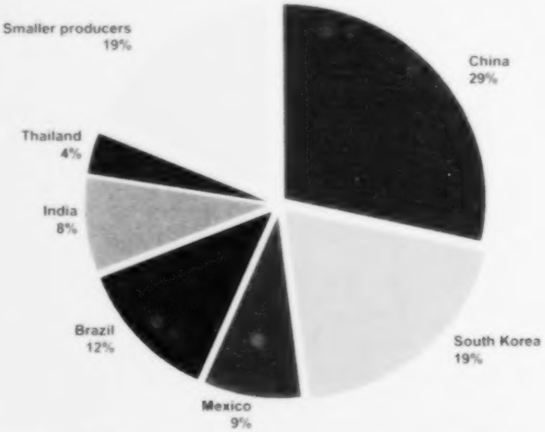
Over the next 20 years, from 1965 to 1985, Japan increased its share of world production of light vehicles from 3% to 29%. In contrast with the North American and European experience, Japan's production increase was largely export driven. Import tariffs and quotas in Europe and voluntary export restrictions in the United States led Japanese producers to open up assembly plants in all their major export markets, lowering the share of Japan in world production to approximately 17% recently. The spectacular appreciation of the yen was an additional incentive for Japanese firms to establish production capacity overseas.

Finally, in the last seventeen years, most of the output growth was in non-traditional car producing countries. While the first three regions saw their combined output fluctuate between 42 and 46 million vehicles with no noticeable trend, production in the rest of the world increased from 2.9 million vehicles in 1985 to 17.8m in 2004. This represents a six-fold increase in output over 19 years or a sustained annual growth rate of more than 10%. As a result, these countries produced more than one quarter of all vehicles worldwide in 2004, and this fraction has increased further in the last two years. To illustrate the importance of the output increase in these countries, Figure 1.1C plots their production level in logarithms (left scale) and their share in world output (right scale) over the last 39 years. Output growth in these countries has been remarkably constant at a very high level. All indications are that this trend will continue in the near future.

The composition of the group of "other countries" is illustrated in Figure 1.2, where the percentages indicate the share of production of each country in the group in 2004. The six most important producers are China, South Korea, Mexico, Brazil, India, and Thailand. In the last 3 years, the importance of China, and to lesser extent India, has increased further. Smaller producers are all countries producing less than 350,000 vehicles per year. One notable fact is that net exporters dominate the group of "other countries". All of the six countries depicted have higher production than domestic sales. Among the smaller producers, only Argentina is an important net exporter. Furthermore, with the exception of Brazil, the largest producers are also the countries with the fastest output growth. Given the high scale economies in vehicle production, it is no surprise that production is relatively concentrated even among emerging countries.

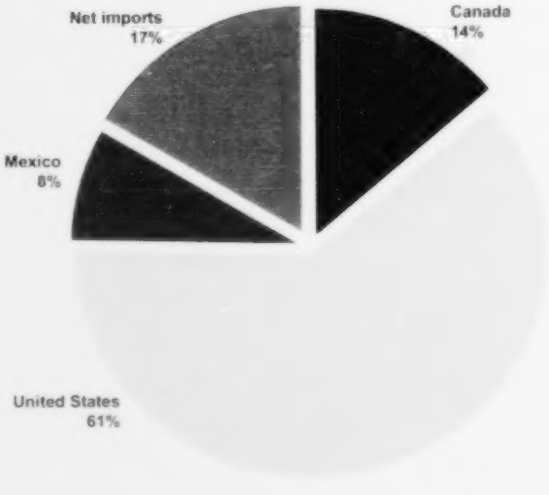
Focusing on the North American market, total sales in 2002 stood just under 20 million vehicles, at 19,487,556. The origin of the vehicles is depicted in Figure 1.3. While the United States accounts for almost 87% of North American sales, only 61% of vehicles are produced in that country. Foreign imports are the second most important source and Canadian production is slightly lower. Mexican production is the least important source, accounting for less than 8% of North American sales, but is growing rapidly. Almost half of all vehicles assembled in Mexico are exported and this fraction is increasing.

Figure 1.2: Composition of the group of 'other countries' (fraction in the group's output in 2004 is indicated)



Source: Ward's World Motor Vehicle Data Book (2005)

Figure 1.3: Origin of vehicles sold in North America (2004)



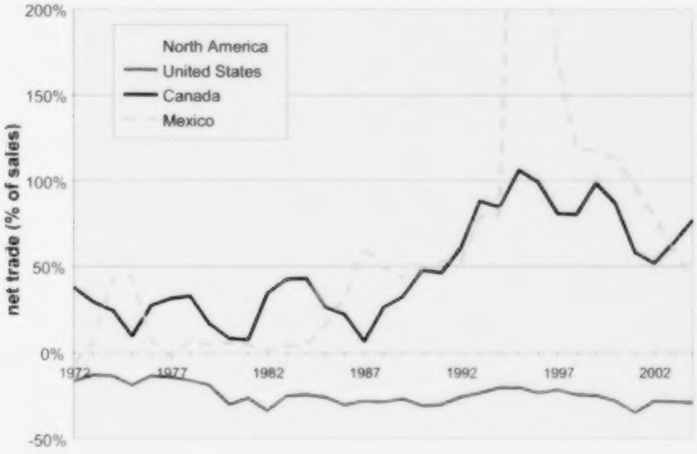
Source: Ward's Automotive Yearbook (2005)

The evolution of international trade on the North American content is also instructive. As a region, North America is running a trade deficit in vehicles that is relatively stable over time. In Figure 1.4, this is depicted by the white line. From 1972 to 2002, imports of finished vehicles fluctuated between 4.6 million units (in 1986) to a low of 1.1 million (in 1995). Net imports as a fraction of sales fluctuated between 10% and 20% in most years. North American exports are relatively unimportant and fluctuations in imports determine the trade balance almost completely. Imports started to decline in the mid-1980s when foreign producers opened their first assembly plants on the continent. In 1982, the year Honda opened its first U.S. plant, 27% of all vehicles sold in North America were imported. This declined to a mere 6.9% in 1995, after which it started to increase again, in line with the rising U.S. trade deficit for the entire economy.

The pattern for the continent as a whole is driven by the United States, which runs an even larger deficit than the region. In Figure 1.4, the blue line for the United States lies everywhere below the white line for North America. The mirror image is trade surpluses by Canada and Mexico. After the establishment of the Autopact in 1965, the Canadian industry integrated completely with the U.S. industry. Between 1972 and 1988, the trade surplus fluctuated between 7% and 43% of Canadian sales, which corresponds to an average net export of 320,000 vehicles, the vast majority to the United States. After the establishment of the Free Trade Agreement with the United States (in 1988) Canadian exports surged, even surpassing domestic sales in 1995 with the expansions of the Honda and Toyota plants coming on steam. Since then, Canadian exports have returned to normal levels, which are still 50% of domestic sales or almost 1 million vehicles.

Closures of assembly facilities in Bromont by Hyundai (1993), in Halifax by Volvo (1998), in Ste. Therese by General Motors (2002), the Pilette Road plant in Windsor by Daimler-Chrysler (2003), and the Ontario Truck plant in Oakville by Ford (2004) reduced Canadian production subsequently. The recently announced closure of the Oshawa 2 plant (2007) and the elimination of the third shift in the Oshawa 1 plant (2006), both by General Motors, will reduce production capacity more than the newly announced assembly plant that Toyota will build in Woodstock (2007). However, it should be noted that increased production at existing plants is likely to lead to stable production levels, as forecasted by CSM.

Figure 1.4: Net trade in light vehicles for North America and individual countries — (production-sales)/sales



Source: Own calculations based on Ward's Automotive Yearbook (various years) and Ward's World Motor Vehicle Data Book (2005)

Mexico has done particularly well, even before the North American Free Trade Agreement took effect in 1996. Its exports grew from less than half a million vehicles when NAFTA was negotiated to over one million vehicles by 2000. This export growth is in sharp contrast with domestic sales which collapsed in 1995-96 (hence the sharp increase in Figure 4), but which have returned to the trend growth path since. Mexican sales increased by 5% per year on average over the last 25 years, only slowing to 3.6% in the last 10 years.

While the Canadian automotive industry has performed well in terms of final vehicle production, the growth rate in components has been even more remarkable. This shows up most clearly in the employment figures for the final assembly sector versus the parts and components sector. Table 1.1 has the employment numbers for the two sub-sectors in 1991 and 2002. The employment share of parts and components in the automotive total grew from 55% in 1991 to 66% in 2002. In Section 1.2, on the vertical organization of the industry, we will discuss the parts sector in greater detail.

Table 1.1: Manufacturing employment in the Canadian automobile industry

	Employment	
	1991	**2002**
Vehicle assembly	53,300	51,000
Parts and Components	65,400	98,100

Source: Industry Canada

Thus far we have discussed the Canadian automobile industry by itself and in relation to the rest of the worldwide automotive industry. It is worthwhile to stress its importance for Canadian manufacturing. Industry Canada estimates that the entire industry employs more than half a million employees in Canada: 171,002 people in automotive assembly and component manufacturing, and another 333,529 in distribution and aftermarket sales and service. Manufacturing is clustered in central Canada, in the heart of the North American auto industry, while distribution is spread across the country. It is Canada's largest manufacturing sector, accounting for 12% of the sector's GDP and 25% of manufacturing trade[2]. In 2003, Canada had an overall automotive trade surplus of $4.6 billion on flows totalling $159.1 billion. Total industry shipments stood at $69.3 billion in vehicles and $31.4 billion in parts in 2003. Production, especially in the final assembly sector, but to a lesser extent also in parts, is concentrated in South-western Ontario.

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[2] Industry Canada, *Canada's Automotive Industry 2004*, http://strategis.ic.gc.ca/epic/internet/inauto-auto.nsf/en/am01722e.html

1.1.2 Future outlook

Even though Canadian exports of finished vehicles are very strong, a concern is the reliance on the U.S. market. Figure 1.5 illustrates that the vast majority of Canadian vehicle exports (HS code 8703) are destined for the United States. The graph on the left illustrates how dominant the U.S. market is, accounting for more than 98% of Canadian exports. Imports, on the other hands, are less concentrated as Japanese, Korean, and Mexican imports have grown from 26% in 1998 to almost 40% in 2004. The graph on the right illustrates the same export numbers, normalizing the 1998 levels to 1. Exports to other countries, the white line, increased noticeably, although from a very low base.

From a policy perspective, there is little Canada can do about this. The export potential for vehicles produced in Canada is entirely driven by the type of vehicles the (foreign-owned) producers decide to allocate to their Canadian assembly plants. In this respect, it is very encouraging that several Canadian plants have received the world mandate for the vehicle(s) they are assembling, meaning that no other plant produces the same vehicle.

Exports of automotive parts (HS code 8708), while also very concentrated on the United States, tend to be slightly more diversified. Throughout the 1998-2004 period, the share of Canadian parts exports going to the United States was constant around 91%. Total parts exports grew substantially over this period and exports to other countries outpaced U.S.-bound exports (see the right graph in Figure 1.6).

In 2004, exports of parts to non-U.S. destinations were worth US$896 million, almost twice the value of vehicle exports outside the United States. Moreover, while Canada had a large and growing trade deficit in vehicles with the rest of the world (excluding the United States), its trade deficit in parts declined from US$1,090m in 1998 to US$800m in 2003, although it recently jumped back up to $1,028m (in 2004).

Even for parts, the United States is by far the most important partner and the concentration of Canadian exports is increasing over time. Table 1.2 indicates that, even though the share of parts exported to the U.S. declined only marginally from 92.5% in 1993 to 91.6% in 2004, the share of the other important export destinations increased noticeably. The five most important export destinations now account for 99.2% of Canadian parts exports. The increase is most visible for exports going to other countries (excluding the U.S.). Compared with the production statistics in Section 1.1.1, Canadian parts exports are clearly more concentrated than worldwide production. In particular, exports to Europe and Japan are much lower than expected.

The ongoing FTA negotiations with Korea could result in a more favourable import regime for Canadian parts and vehicles and increase Canadian exports to that part of the world. The recently started trade talks with Japan would work towards the same goal in Japan and the Free Trade Area of the Americas could increase Canadian exports to Latin America as well. Given the low level of trade protection, at least in terms of import tariffs, only moderate effects are expected from these initiatives. The concentration in the industry means that individual firm decisions are likely to determine the trade flows and balances. For example, as long as GM was exporting body panels to its Buick plant in China, Canada was running a large trade surplus with China. The end of these exports in 2004 instantly almost halved Canada's exports to China[3]. In terms of trade policies, all changes are in the right direction, we just expect them to be of second-order importance.

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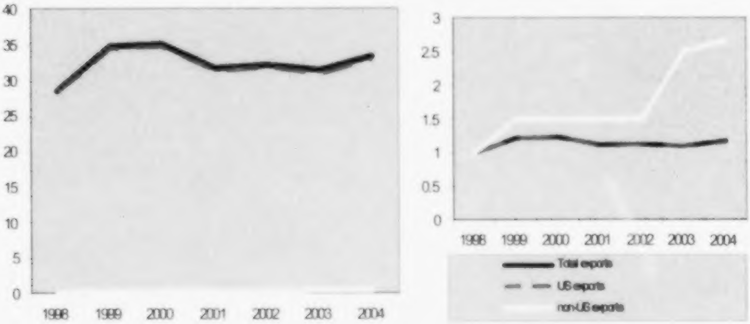
[3] The Asia Pacific Foundation of Canada, (2005) "The East Asian Automobile Industry: Opportunity or Threat?"

Figure 1.5: Canadian exports of finished vehicles (billion US$ left, 1998=1 right)

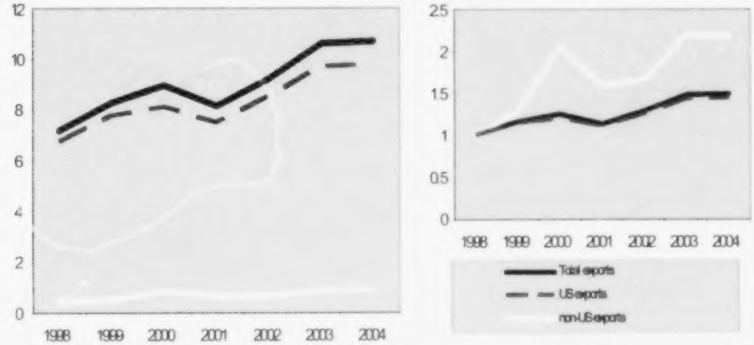


Billion US$

1998 = 1

Source: U.N. Comtrade data set (online)

Figure 1.6: Canadian exports of automotive parts and components (US$ left, 1998=1 right)



Billion US$

1998 = 1

Source: U.N. Comtrade data set (online)

Table 1.2: Origin and destination of trade in parts and components (fraction of total)

	Imports			Exports	
	1993	**2003**		**1993**	**2003**
USA	0.857	0.875	USA	0.925	0.916
Share of trade excluding the U.S.			**Share of trade excluding the U.S.**		
Japan	0.451	0.427	China	0.196	0.562
Mexico	0.300	0.257	Mexico	0.208	0.213
E.U.	0.177	0.165	E.U.	0.119	0.092
China	0.002	0.054	Japan	0.085	0.039
Korea	0.033	0.030	Latin America	0.060	0.037
Latin America	0.018	0.026	Australia	0.194	0.019
Eastern Europe	0.001	0.012	Eastern Europe	0.022	0.015
India	0.001	0.007	Other Asia	0.022	0.007
Australia	0.014	0.006	Korea	0.005	0.004
Thailand	0.001	0.006	Thailand	0.000	0.002
Other Asia	0.000	0.005	India	0.001	0.000
Rest of the world	0.007	0.041	Rest of the world	0.090	0.009
Top 5 (overall)	**0.994**	**0.988**	**Top 5 (overall)**	**0.979**	**0.992**
Top 4 (non-US)	**0.961**	**0.903**	**Top 4 (non-US)**	**0.717**	**0.906**

Source: U.N. Comtrade data set (online)

Mexico, the second most important trading partner for Canada in 1993, is now surpassed by China, where more than half of all Canadian (non-US) parts exports were heading in 2003. The large increase of exports to China, where the domestic automotive industry is expanding rapidly, seems particularly vulnerable. For example, Magna International, by far the most important Canadian parts exporter, is increasing its production capacity in Asia. These trends are already reflected in the huge relative fall-off of Australia and the rest of Asia as an export destination for Canadian parts. In contrast, the most rapidly increasing assembly regions of the world, except for China, i.e. Eastern Europe, Korea, Thailand, and India, are not yet important trading partners for Canada.

On the import side, on the other hand, the growth of the automobile industry in developing countries is already making a small impact. The share of Canada's part imports coming from the top 4 countries (excluding the U.S.) decreased from 96.1% to 90.3%. The countries with growing automobile industries figure prominently. China, Eastern Europe, India, and Thailand all post enormous increases, albeit from a low base.

Finally, we take a look at the 10 most important (6 digit HS) products in Canada's exports; Table 1.3 has the list. These account for 93.4% of Canadian parts exports in 2003. The share of the United States is again extremely high and for most products the U.S. import growth is rather high. The right-most columns indicate the export growth of Mexico and China in each of the ten parts. The export levels for each of these parts are relatively low in these countries, but the growth rates are extremely high. Importantly, they tend to be much higher than the growth rate of U.S. import demand.

For the Canadian industry it is extremely important to continuously find new products where it can establish a comparative advantage. For example, in 1998 U.S. imports of "fittings" and "electric lighting" were negligible and currently all Canadian exports of these two products go to the U.S. In 2003, these two products combined accounted for more than 18% of Canadian parts exports to the U.S.

Table 1.3: The 10 most important Canadian automotive component exports in 2003

		Importance of USA		**Export growth of**	
Top 10 parts (excluding n.e.c.)	**Share in Canadian parts exports**	**Share**	**Import growth (av. +32%)**	**Mexico (av. +53%)**	**China (av. +307%)**
Brake system	0.252	0.96	32%	42%	207%
Bumpers	0.165	0.96	18%	158%	121%
Fittings	0.136	1.00		74%	-71%
Wheels	0.126	0.91	79%	157%	554%
Mufflers	0.069	0.99	79%	281%	1835%
Safety glass	0.048	0.87	23%	-6%	225%
Electric lighting	0.046	1.00		199%	264%
Shock absorbers	0.036	0.89	20%	1090%	3066%
Safety belts	0.033	0.73	-44%	14%	4848%
Seats	0.023	0.99	-99.7%	301%	2401%

Source: U.N. Comtrade data set (online)

1.2 Vertical organization of the industry

1.2.1 Current impact

Until the 1960s, the two major firms in the North American industry, GM and Ford, were highly vertically integrated. Chrysler outsourced a larger fraction of its component inputs. The establishment of Japanese-owned assembly plants on the continent, starting in 1982, reversed the trend and independently owned suppliers flourished. Managing a supply chain of several thousand firms proved to be exceedingly complicated and over the last 15 years the industry organized into a tiered supplier network. The final vehicle producers—OEMs—would outsource major components or subassemblies to Tier 1 suppliers, which in turn outsourced several of the components to Tier 2 suppliers, and so on. As a result, the OEMs dramatically reduced the number of suppliers they had to deal with directly, without giving up the benefits of specialization.

1.2.2 Future impact

In recent years this arrangement has started to change again. It is too early to know whether these trends will radically change the organization of the industry, but the following five issues have received a lot of attention recently:

- Suppliers are increasingly involved in the design and development of the parts they produce. One of the main benefits is to cut development time. While twenty years ago, a model had an average product life of 7 years, the main Japanese producers now introduce new versions of the majority of models in their lineup every 4 years. Hyundai is even trying to achieve the same feat every three years. To facilitate this rapid product turnover, R&D is pushed upstream. In 2003, Andrew Brown, Delphi's executive director of engineering, claimed his company was spending US$2 billion in R&D and engineering worldwide, almost 8% of sales: "Most innovations in safety, emissions, and entertainment come from Tier 1 suppliers." In a 2002 study prepared for Accenture by the Center of Automotive Research (CAR) in Michigan, the share of components in the total value generated in the U.S. automobile industry was estimated at 58.3% for 1990, against 24.5% of the value generated by the vehicle producers. This declined to 56% in 2000, but is expected to increase to 63-65% by 2010.
- Cost control by OEMs is increasingly focused on streamlining the supply chain. The process of outsourcing entire modules to Tier 1 suppliers and delegating responsibility for the design and subcontracting has probably gone furthest in interiors and seats. Lear, Johnson Controls, and Intier dominate that industry and handle the design of complete vehicle interiors. Recently, GM announced that it would take more control over its interiors and work directly with smaller suppliers. GM believes it can more effectively control costs and quality by bringing more work in-house. This initiative is just one facet of wide-ranging cost cutting programs in purchasing that all the major auto-

makers have engaged in. GM has just finished a three year program aiming to cut its component costs by 20%. Given that the company's purchasing bill runs at US$86 billion annually, savings can potentially be huge. An important new addition to the program is that in the next two years GM will require all its 250 largest suppliers to have offshore manufacturing capabilities. This is in addition to any price target.

- While assemblers are bringing some tasks back in-house, at the same time the role of Tier 1 suppliers is increasing in some vehicle programs. For niche vehicles or low-volume cars the entire assembly is sometimes turned over to an outside contractor. This practice allows OEMs to assemble vehicles locally without large capital investments or to increase production capacity when their own assembly plants cannot satisfy demand for an unexpectedly successful model. In addition, suppliers are sometimes in charge of building a convertible or stretched vehicle from an existing sedan or adding four-wheel drive. Magna Steyr is a prime example of such a "Tier 0.5 supplier" strategy, with an increasing focus on assembly. Currently it produces the Mercedes-Benz G-class, Jeep Grand Cherokee, and the Chrysler 300C in Europe for DaimlerChrysler and it is the sole assembler for the BMW X3. In the past it also developed and produced convertibles, four-wheel drive, and stretched vehicles for Saab, Volkswagen, Audi, and Mercedes-Benz and it is currently designing the new Stillo for Fiat. Karmann in Europe and ASC in North America are other firms with expertise in this area.
- An alternative to outsourcing the assembly entirely is to bring modulization to the assembly plant. An important trend, especially in Europe and Latin America, is the factory-within-a-factory cooperation between OEMs and suppliers. Within the Nissan assembly plant in Sunderland (U.K.), Karmann installs the folding hardtop roofs on the Micra. Starting in 2006, when the new compact minivan will be introduced, Magna Kansei will install its own cockpit modules and Calsonic Kansei the front-end modules, again operating within the Nissan plant. Similarly, Kuka Group will run the paint, body, and chassis operations of the new Daimler- Chrysler Toledo (OH) assembly

plant, which will open in 2006 and produce the Jeep Wrangler. Kuka and three other suppliers are investing US$300 million in the new plant. Other important projects are DaimlerChrysler's Smart plant in France, its Campo Largo plant in Brazil, Volkswagen plants in Resende, Brazil and Mlada Boleslav, Czech Republic and GM's Blue Macaw plant also in Brazil.

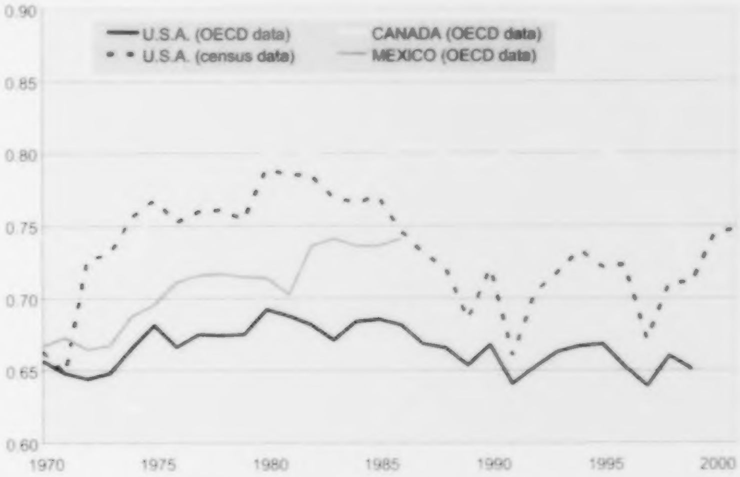
- Finally, the closer integration of OEMs and their suppliers increase the stakes when unexpected things happen, such as the current spike in raw material prices. This has led to a number of bankruptcies and court cases. With several large suppliers, most notably Delphi, Collins & Aikman Corp, Tower Automotive, and Federal-Mogul in Chapter 11 bankruptcy restructuring, the exposure of OEMs to problems at their suppliers is becoming apparent. Without Ford's assistance Visteon would also have had declare bankruptcy. Several of the companies are kept alive by credit from their clients which would suffer from the disruption of their supply chains. Several disputes center around the sharing of increased raw materials costs. While the most successful suppliers, such as Robert Bosch and Valeo, have been able to pass some of the increases in steel prices to their clients, a similar attempt by Lear has landed it in court. Its dispute with DaimlerChrysler affects 12 final assembly plants and is closely watched by the rest of the industry.

1.2.3 Canada's position

The share of intermediate inputs as a fraction of the value of vehicle production is higher in Canada than in the United States. Figure 1.7 uses industry data compiled by the OECD to track the evolution of the material cost/sales ratio for the motor vehicle industry in each of the three North American countries. The Mexican and, especially, the Canadian industries outsource more of their material purchases than the U.S. industry. In Canada, material purchases as a percentage of final sales in the motor vehicle industry even exceeded 80% in the early 1970s, while in the U.S. it peaked at 69%.

From 1971 to 2001, assembly plants in each country initially outsourced more tasks and inputs, but this reversed towards the end of the century. In 2001, the U.S. industry is back where it started, purchasing 60% of its sales value from other industries. The Mexican ratio converged to the U.S., testament of its close integration in recent years. In Canada materials still take up a larger share of sales, which might be related to the important presence of DaimlerChrysler and Magna, two companies that have been instrumental in the push towards modulization of assembly.

Figure 1.7: Share of intermediate inputs in total sales



Source: STAN data set (OECD) and U.S. Bureau of the Census

Table 1.4 contains the most important Canadian firms in the automotive parts and components sector. The importance of Magna International is striking. It is more than 10 times larger than the second Canadian firm, Linamar and 18 times larger than the ABC Group, the Canadian number three. The Canadian share of North American light vehicle production in 2002 was almost 16%, but only 5% of the major component suppliers have Canadian headquarters. In 1999, Faurecia, Decoma, and F&P Manufacturing still were operating regional headquarters in Canada, but by 2002 their Canadian affiliates did not report as separate suppliers anymore.

Recently, wage pressures on the industry have increased. The large incentives offered by the OEMs to boost sales have been accompanied by increased cost cutting efforts. Outsourcing components to Asia, especially to China, is a first manifestation of this trend. The difficulty of Delphi and Visteon, formerly owned by GM and Ford, to maintain high wages is a second manifestation. The 2003 wage negotiations between the UAW and Delphi introduced dual wage profiles at the largest North American supplier, allowing the firm to pay newly hired workers less than insiders. Finally, given that suppliers tend to be smaller firms than OEMs, the wage gradient by firm size influences the relative competitiveness of different countries in attracting suppliers. Statistics in Table 1.5 indicate that, even though the average salary in the automotive industry was significantly lower in Canada than in the U.S., this is reversed for the smallest firms. U.S. firms that employ less than 20 employees paid an average salary of C$30,940 in 1995, while Canadian firms of similar size paid C$36,300.

Table 1.4: Canadian top suppliers (NA rank)

	1993		1999		2002	
	(top 100)		(top 150)		(top 150)	
	sales	**NA rank**	**sales**	**NA rank**	**sales**	**NA rank**
Magna Int.	2,450	7	5,760	6	7,650	5
Linamar Corp.			687	54	712	56
AG Simpson			407	91	245	129
Multimatic			356	107	342	110
ABC Group			323	110	423	94
Meridian Tech.			306	117	207	147
FAG Autom.					210	145
Fabricated St. P.	160	71				
Faurecia			586	64	HQ in France	33 (parent)
Decoma Int.			496	80	HQ in US	45 (parent 2000)
F&P Mfg			291	125	HQ in US	84 (parent)

Source: Automotive News

Table 1.5: Wage gradient by employment category in the motor vehicle industry (1995)

Employees:	1-19	20-99	100-499	499+	Industry average
Canada	0.75	0.71	0.81	1.1	C$48,400
USA	0.55	0.64	0.68	1.06	C$56,250 (US$41,000)

Note: Average salary (including benefits) for firms in different size-categories (measured by employment) as a fraction of the average salary for the industry.

Source: OECD

Of course, comparisons like this are highly sensitive to the exchange rate of the moment. The enormous appreciation of the Canadian dollar since 2002 has further eroded the competitiveness of Canadian suppliers.

While the automobile industry spends enormous sums on R&D, to a large extent this bypasses the Canadian industry. The vast majority of innovation is done at company headquarters, which are only rarely in Canada. Table 1.6 lists the location of the headquarters of the top 150 (top 100 in 1993) suppliers in the North American automobile industry. While 9 of the largest firms were headquartered in Canada as recent as 1999, this declined to only 7 in 2002. Only two companies improved their rank. At the same time, Mexican and European firms increased their presence. In contrast, the importance of Michigan is striking. In 2002 it was home to 82 of the top 150 suppliers, a full 55%. Within Michigan, firms are concentrated in Detroit, Troy, and Auburn Hills, where GM, Ford, Chrysler, and Delphi have their headquarters. As the OEMs have disintegrated vertically, geographic proximity has become a substitute for ownership ties to smooth commercial interactions.

Table 1.6: Location of top supplier headquarters (to the NA industry)

	1993 top 100	1999 top 150 (100)	2002 top 150 (100)
Canadian	2	9 (5)	7 (3)
Mexican	0	2 (1)	3 (3)
European	0	2 (2)	4 (3)
Michigan	51	72 (51)	82 (52)
Detroit-Troy-Auburn Hills	24	32	33
Other Midwest[1]	24	36	30
Southern U.S.[2]	8	17	16

Notes:
[1] OH, IN, IL, and PA;
[2] AL, FL, KY, MO, MS, NC, SC, TN, and TX

Source: Automotive News

1.3 Flexible production

1.3.1 Current impact

In the automobile industry, flexibility is the new buzzword in manufacturing. Increased competition has led manufacturers to increase the number of products they offer for sale. Traditionally, each assembly plant produced a single model or a few similar ones. The explosion in models for sale made it prohibitively expensive to continue this practice. As a result plants are being forced to assemble several models on the same assembly line, which has important consequences for production and trade.

A first effect is that the exploitation of flexibility often goes together with diminished emphasis on realizing scale economies. While the average plant size has been decreasing gradually over the last 30 years, as the industry made the transition from mass to lean production, the recent decrease is more pronounced[4]. New plants announced in North America have often been in the 100,000 unit range, although subsequent capacity additions have made the difference with existing plants smaller. China, where most of the recent capacity additions have taken place, has an average plant size of approximately 50,000 vehicles[5]. The minimum efficient scale of an automobile assembly plant seems to be falling.

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[4] For detailed information on this, see Van Biesebroeck (2006), "Productivity Dynamics with Technology Choice: An Application to Automobile Assembly," *Review of Economic Studies*, 70(1), pp. 167-98.

It is hard to know whether it is the cause or the effect of the manufacturing flexibility, but the number of models for sale has increased dramatically in recent years. Table 1.7 illustrates this trend over the last 30 years. Models for sale in the United States increased from 133 in 1974 to 282 in 2004. The growth has been much more pronounced in light trucks than passenger cars, and in the former category it does not seem to have topped out. The trends for the number of models sold and produced in North American are by and large similar.

Table 1.7: Number of car and truck models sold and produced in North America (1974-2004)

	1974	1984	1994	2004
Models for sale in U.S.	133	195	238	282
Cars	96	140	164	167
Light trucks	37	55	74	115
Models for sale in NA	185	228	273	320
Models produced in NA	90	125	139	165

Source: Ward's Automotive Yearbooks and Ward's Infobank (2004)

One way to increase product variety is to sell mechanically similar cars under different nameplates. Models that share a platform can be made to differ mainly in appearance, standard features, and trim level, while it is straightforward to develop and assemble them together. All firms have mastered such a 'platform stretching' strategy, even though they do not all use it to the same extent. The number of platforms in production has increased notably less than the number of models[6].

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[5] The substantial involvement of provincial governments in China, aimed towards attracting automotive investment to their province, makes it not unlikely that production in China is taking place below efficient scale.

[6] For details, see Van Biesebroeck (2006), "Complementarities in Automobile Production," *Journal of Applied Econometrics*, forthcoming.

A by-product of the increased variety is the emergence of new market segments and different sources of differentiation. Imported vehicles are no longer either small, reliable and cheap or high quality, luxurious sport sedans. Given the multidimensional product competition, the nationality of the owning firm is becoming an ever smaller factor to explain a vehicle's attractiveness. From the consumer's point of view, the difference between vehicles produced by domestic or foreign producers is becoming smaller. Their product lines overlap almost completely and there is no single characteristic on which domestic and foreign vehicles differ consistently.

1.3.2 Future impact

Smaller, nimbler plants could be operated at a higher rate of capacity utilization. Recent research of CAR in Michigan indicated that, in the latest economic downturn, capacity utilization in the industry hardly declined, even though profits were dragged down by lower prices. It is suggested that the break-even point in capacity utilization has increased substantially over time. Trade can be a contributing factor to make sure factories operate as close to full scale as possible. Previously, plants had to be dedicated to a single model and capacity utilization fluctuated with the popularity of that model. The ability to produce a wide variety of models in a single plant allows firms to tailor production more closely to demand. Especially for foreign producers, flexibility allows firms to rely less on imports and produce more domestically, operating their North American plants closer to full capacity.

The average plant size in countries with more recently built assembly plants is certainly lower than in the United States or Canada. Even in Mexico, average capacity is 140,000 vehicles relative to 200,000 further north. In China especially, many smaller plants are being built. To some extent this merely represents cautious entry in an uncertain market or by new firms, but also more established plants by Western multinationals tend to be smaller. It is not implausible that Canadian plants will also become smaller in the future.

1.3.3 Canada's position

As mentioned, in the long run it is not impossible that greater flexibility will lead to lower imports even without new capacity additions. For example, Honda claims all its assembly plants can produce its entire model range with a relatively low productivity penalty. When the firm initially established a manufacturing presence in the United States it was only natural to produce first only its best selling vehicles, the Civic and Accord. Now that it operates several plants across the continent, flexibility will allow the firm to shift production to the vehicles most in demand and avoid having idle capacity in North America, while importing different models from overseas. However, for this to be a reality, the entire supply chain has to become equally nimble. Different vehicles require different components and the suppliers have not yet matched the OEMs' flexibility.

Even though Japanese plants in the United States were the first to be flexible, the technology is now spreading through the industry. In Canada, Honda claims to be able to assemble almost its entire line-up in each plant. Its Alliston plant in Ontario has produced a wide range of vehicles in the last decade. The Ford plant in Oakville is currently undergoing a $1 billion investment project to make it one of its most flexible facilities. The DaimlerChrysler plant in Windsor assembles three models derived from two different platforms, which is the ultimate in flexibility. Finally, also Toyota has manufactured a wide range of models in Canada, including the first Lexus being produced outside of Japan.

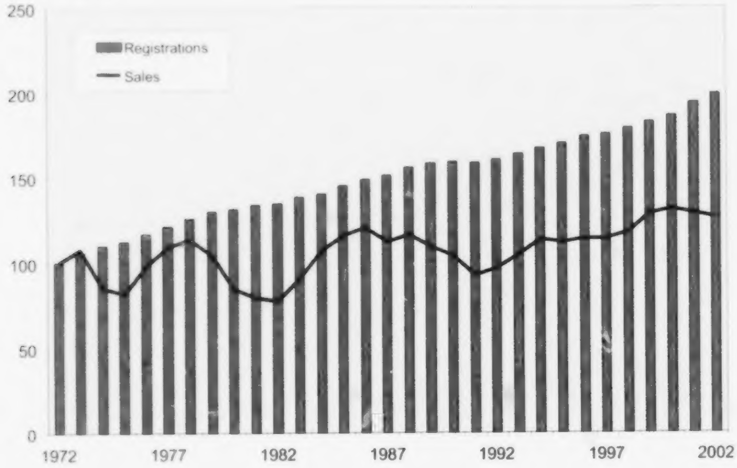
1.4 Stock of vehicles

1.4.1 Current impact

The North American light vehicle market recently has had a string of record sales years. At the same time the average expected lifetime of a vehicle in Canada has risen from 7.7 years or 154,000 km in 1970 to 11.6 years or 227,000 km today. As a result, new sales outnumber the number of vehicles that are scrapped, increasing the number of vehicles on the road. Figure

1.8A shows for the United States sales and registrations from 1972 to 2002, both normalized at 100 in the first year. Clearly, the combination of increased durability with record sales has increased the number of registrations ever higher. In 2002, almost 236 million vehicles were registered in the United States.

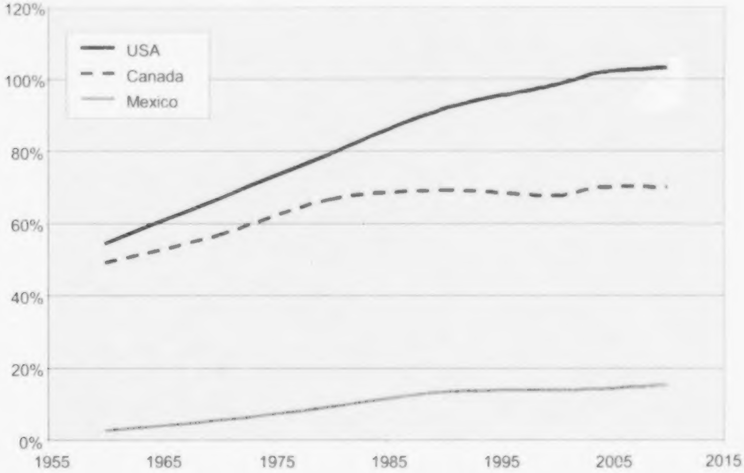
Figure 1.8A: Vehicle sales and registrations in the United States (1972 = 100)



Source: Ward's Automotive Yearbook (various years)

To put the increasing stock of vehicles in perspective, Figure 1.8B plots registrations as a fraction of the population of driving age. For the United States this increased from 55% in 1960 to 102% in 2004. The growth in this ratio is projected to decelerate and only reach 103% by 2010, but that will only happen if sales of new vehicles drop far below current levels. The ratio is lower in Canada, but one cannot automatically infer that the potential demand is larger. Canadians are not as rich as Americans, on average, and more likely to live in cities, which lowers demand for vehicles. By 1990, there were 0.69 vehicles per person of driving age and this has remained virtually unchanged in the last 15 years, only reaching 0.70 in 2004. Growth opportunities in Mexico are much larger. The current vehicle penetration rate is much lower and still increasing, although only very slowly, because population growth is relatively high.

Figure 1.8B: Total vehicle registrations per driving age population



Source: Ward's Automotive Yearbook (various years)

On the demand side quality is becoming a less important factor as well. This is not really surprising as there are decreasing marginal returns to everything. The large quality improvements by GM over the 1990s have not provided the anticipated sales boom. The stellar quality record of GM's Oshawa 2 plant did not prevent an announcement of its prospective closure. The quality record of Buick hardly translates in higher sales. In the 2004 Vehicle Dependability Study by J.D. Power which looks at longer term (3 year out) defects, Buick was the second most reliable brand in North America, only topped by Lexus. GM brands with average number of defects below the industry average include Buick, Cadillac, Chevrolet, GMC, Saab, and Saturn. Only Pontiac and the discontinued Oldsmobile perform more poorly than average, but this has not prevented GM's market share from slumping continuously. Similarly, Hyundai passed Toyota in the initial quality survey (after 3 months of ownership), but it still sells its cars at a discount relative to its Japanese competitors.

1.4.2 Future impact

Automobiles are durable goods and sales predictions are obviously affected by the stock of vehicles in the economy. The preceding analysis points to weaker sales in years ahead. At a micro level, the industry got a taste of what is to come when sales of the Big Three collapsed in the fall of 2005 after a summer where "employee discount plans" spectacularly increased sales. At an economy-wide level, the bumper sales years of the last half decade will most likely translate into lower sales years ahead. For example, Automotive News predicted 2006 sales to be 4% below the 2005 level for the U.S. at 16.5 million units. Ward's predictions were similar and they expect further declines in 2006 if GM and Ford hold firm on their commitment not to boost fleet sales[7]. Moreover, the mix of vehicles is also shifting towards more economical and smaller cars. For Canada, EDC Economics predicts exports of vehicles to decline by 3% in 2006 and 5% more in 2007, reflecting softening demand in the U.S.

At the same time the fleet is aging. As people owning a second hand vehicle are less likely to trade it in for a new car, future demand for new vehicles might fall off even more rapidly than the registration statistics suggest. Currently, the group of cars 1–5 years old is larger than the group of 10+ year old vehicles, and this is expected to remain true for another 3 years. Later, the group of very old vehicles will become the largest. As vehicle durability is maintained or even rises in the future, the owners of very old vehicles will have very little incentive to replace their vehicles. The solid lines in Figure 1.9 indicate that the resale value of four year old passenger cars and light trucks has decreased almost continuously over time.

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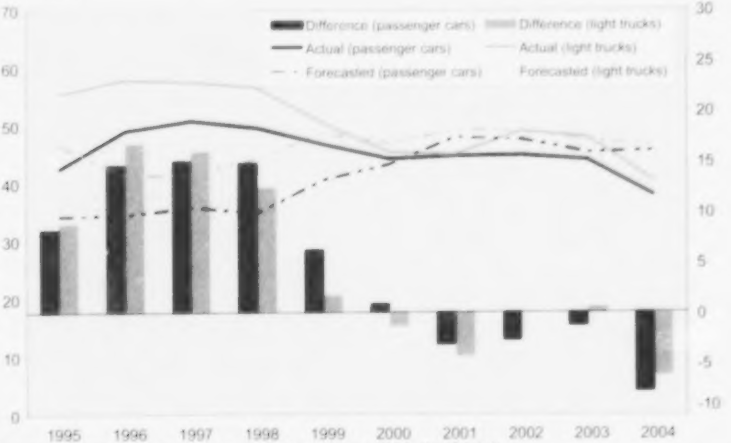
[7] The economic outlook of the government's Consensus Revenue Estimating Conference by the Administration, House Fiscal Agency, and Senate Fiscal Agency as agreed to at the January 12, 2006 meetings was slightly more optimistic forecasting 16.7 light vehicle sales in 2006 and 16.8 in 2007.

Figure 1.9: Predicted and actual resale values of 48 month old vehicles (Canada)



Source: DesRosiers "Industry Overview 2004" (2004)

In the past, firms promoted leasing to entice customers to trade in vehicles more quickly. In Canada, leasing peaked in 1997 at 46.8% of all new car registrations. In the following years, rising income levels made car ownership more affordable and leasing rates declined to only 28.1% in 2003. This suggests there is scope for growth by pushing leasing over buying. However, increased durability of vehicles has pushed up predicted resale price of off-lease vehicles, the dotted lines in Figure 1.9, making leasing very advantageous to consumers.

By 2004, lessors had predicted much higher resale value for their fleets than actually realized, resulting in negative off-lease values for their customers (the bars in Figure 1.9). This made it exceedingly disadvantageous for the lessees to take possession of their leased vehicles at the end of the contract, depressing recent resale values even further. Future lease contracts are expected to become more expensive as lessors take into account lower projected resale values. Less leasing could lead to slower vehicle turnover and lower sales of new vehicles.

Exporting excess supply of second hand vehicles to less developed economies is a viable alternative that E.U. countries are actively taking advantage off. Canadian exports of used vehicles rose from around 15,000 in 1994-96 to more than 200,000 in 2001-02. The recent increase in the exchange rate has choked this trade. In the future, trading second hand vehicles with Mexico or other countries in Latin America could be an option that would benefit the Canadian industry. To stimulate the local automotive industry several countries, notably Brazil, have made trade in used vehicles very difficult. It is common practice for countries, even those with no domestic automobile industry, to charge higher import tariffs on second hand than new vehicles (often for emissions or safety reasons). The Free Trade Area of the Americas could prove very beneficial in this regard. Facilitating exports of second hand vehicles to the south would benefit the domestic industry.

1.4.3 Canada's position

What makes the previously described situation precarious for Canada is that the North American industry is plagued by overcapacity. For the industry, total excess capacity is estimated at approximately 0.5 to 1 million units, but this combines larger excess capacity at some firms, most notably GM and Ford, and a projected capacity shortage at other firms, notably Honda and Toyota. Over the last several years, the Big Three American firms have taken capacity from the market, while transplants are building new plants and this process is likely to continue. Canada has benefited from this as Toyota, Honda, and Suzuki (in a joint venture with GM) now operate plants in Ontario. The recently announced closure of the GM plant in Oshawa and the elimination of one shift in another plant will be partly compensated for by the new plant Toyota will build in Woodstock, Ontario, close by its current Cambridge complex.

The reductions in capacity far outstrip the additions. Including the GM announcement, 6 assembly plants will have been closed in Canada between 1993 and 2007, while only Honda and Toyota (in two locations) have substantially increased production capacity. Ford is expected to announce the closure of at least four assembly plants in North America early in 2006. While the large investment in a flexible production system for the

Oakville plant bodes well for its future, the future of the St. Thomas plant is more uncertain.

Over the longer term, the industry is only viable if production capacity matches demand. If future sales in North America will be lower than today, more closures will be inevitable.

1.5 New technologies

1.5.1 Current impact

The primary new technology in automobile production is the flexible plant, discussed earlier. Important evolutions in vehicle technology are taking place in powertrains. In Europe, fuel efficient diesel engines are outselling gasoline cars. Direct injection has vastly improved mileage and lowered emissions. In addition, diesel engines tend to last at least 25% longer than gasoline engines. The catalysts in the cleanest diesel powered vehicles require sulfur-free fuel, which will only be available in North America in 2006.

In North America, the preferred way to achieve similar fuel efficiency is through hybrids. A battery pack is added to the vehicle, which is charged by a smaller combustion engine and by power-recycling technologies when the vehicle brakes. In stop-and-go traffic an electric engine provides (additional) acceleration power, while the gasoline powered combustion engine can function at optimal operating speed. On the highway, gas mileage in the two most popular hybrids, Toyota Prius and Honda Civic (4.2 and 4.3 l/100km), is comparable to the Volkswagen diesels in the Golf or Beetle (4.6 l/100km); in city driving the hybrids deliver superior mileage.

The second important trend in vehicles is the growing importance of electronics. This was clearly illustrated in 2004 when Robert Bosch became the largest component supplier in the world, and Siemens VDO was the fastest growing of the top suppliers. Both firms specialize in electronics. Visteon and Delphi, the two largest North American suppliers, are rapidly increasing their electronics division, which for Delphi is already responsible for more than 20% of revenue. Not only are the electronics-intensive firms growing most rapidly, they also spend a lot on R&D. Siemens VDO, Hella, and the electronics division of Visteon report spending 9% of sales on R&D; Bosch is not far behind at 7.1%. This is well above the industry average of 4%.

1.5.2 Future impact

The future of drivetrain technology is likely to be the fuel cell, as the "hydro economy" develops. Each major automobile manufacturer is involved in developing fuel cell vehicles, which is certain to represent a much more dramatic shift for the industry. The outlook and especially the timing are highly uncertain, but Canadian industry is very active in this field. Ballard Power, headquartered in Vancouver, is considered to be one of the world leaders in fuel cell technology. It is already a supplier to the automobile industry and thus well placed for the future. Other Canadian companies active in the development of fuel cell technology for vehicles are Astris Energy, Cellex Power, and Zongshen Pem Powersystems.

While fuel cells are important for the long-term future, electronics will matter greatly in the years to come. For North American suppliers, the top three concerns are to (1) broaden their client base to include transplants, (2) get compensated for raw material price increases, and (3) expand in electronics. The first and third items are identified as the most import growth opportunities for domestic suppliers. It is estimated that the electronics content in the average vehicle will increase from US$2,250 in 2000 to US$3,850 by 2010. In addition, OEMs expect that by 2010 50% of all R&D—a large fraction of this in electronics—will be carried out by suppliers.

Finally, the importance of the Internet is also felt in this industry. On the consumer side, in Canada as in the United States, new vehicles have to be sold by dealerships. As a result, online purchasing has never taken off, even though the second hand car market has taken advantage of the Internet to organize classified ads, but also for transactions. A result of the wealth of information accessible on the Internet is the increased bargaining power of customers, at the dealers' expense. Profit margins in dealerships have declined noticeably in recent years. The "employee pricing" schemes that the Big Three ran in the U.S. and Canada over the summer of 2005 could have a lasting effect as consumers were particularly attracted to the no-haggling buying process.

On the B2B side of the market, the demise of the cooperative online auction website Covisint has left each company organizing much of its own purchasing again. For Canadian suppliers to OEMs as well as for the Canadian aftermarket it is especially important to follow developments in the United States. E-commerce applications are subject to network effects and getting locked into an incompatible standard can be very costly. At the same time, timely and accurate communications can provide large productivity gains and Canadian firms do not want to come late to this technology.

1.5.3 Canada's position

No Canadian assembly plant produces hybrids, and this is likely to remain so until Ford brings the hybrid versions of the Edge to Oakville, which is currently projected to happen only in 2010. While most Civics sold in North America are produced in Alliston, Ontario, hybrids are imported from Suzuka, Japan. The Honda Accord is also only produced with gasoline engines in Marysville, OH, while hybrids are imported from Sayama, Japan. Similarly, the Lexus RX 330 is produced in Cambridge, Ontario and Kyushu, Japan, but the Japanese plant is the only one that produces the hybrid version (400h). Even GM has chosen to launch production of its Chevrolet Silverado hybrid pickup truck in Fort Wayne, IN, even though the Oshawa plant is the lead plant for the vehicle. Ford produces its Escape hybrid alongside the regular Escapes in Kansas City, MO and Avon Lake, OH[8].

The current popularity of hybrids, also in Canada, is very strong. In 2005, the Honda Civic hybrid was chosen as the family sedan of the year by Consumer's Report while the Toyota Prius took top honours as the Car of the Year. Waiting lists for the Prius are still running over half a year. North American sales in 2003, for all hybrids combined, were only 40,000, but are expected to reach 177,000 in 2005. A total of 28 models—18 trucks and 10 cars—are expected to offer hybrid powertrain options in 2008. Thus far, all of this is bypassing the Canadian industry.

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[8] It should be noted that GM does produce E85 vehicles in Canada, such as the Monte Carlo, Impala and the Silverado.

It is unlikely that the new diesel technology will ever be as popular as the hybrids, but the Canadian industry is again not very involved. Two of North America's largest engine plants are in Canada. Ford's Windsor plant has a capacity of approximately 600,000 engines, mostly V6's, but its future capacity utilization will depend on Ford's future restructuring plans. GM's St. Catherines plant used to be even larger, but high fuel prices have put the demand for V8 engines in doubt. Cylinder deactivation technology, such as that in the Impala, allows for substantial fuel savings and have proven to be popular. No diesels or hybrids are made in Canada.

Of the top Canadian suppliers, Magna has a sizeable electronics division, and also the ABC Group, Canada's third largest supplier, is heavily involved in electronics. All other large Canadian suppliers, Linamar, Multimatic, A.G.S. Automotive Systems, Meridian Technologies, and FAG Automotive, tend to have their comparative advantage in mechanics. Advanced technologies are equally important here, but the value added share of the vehicle is clearly shifting towards electronics.

Finally, we list the trading partners and products that Canada is running a trade surplus with in automotive components. Figure 1.10 illustrates that Canada is running a trade deficit with all its primary trading partners in components. The deficit is especially large with Japan, where Canada is importing 20 times as much as it is exporting. With several of the fast growing automobile producing countries, such as Brazil, South Korea, India and Thailand, Canada is also running a deficit. China is the one positive note, but the rapid expansion of the Chinese automotive industry combined with a deepening of its domestic supply chain puts much of those Canadian exports in doubt for the near future.

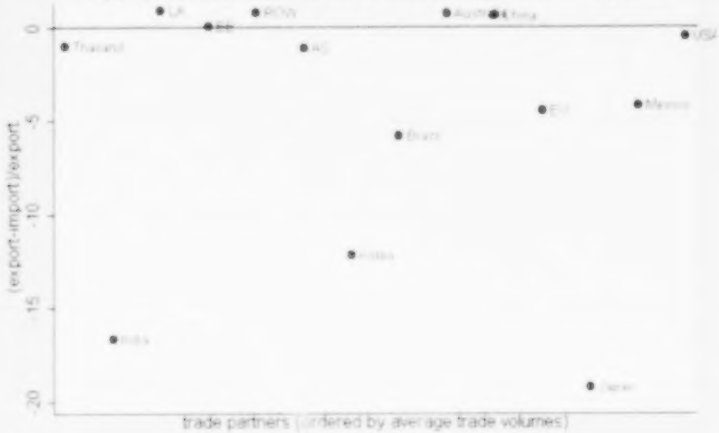


Figure 10: Net exports as a percentage of total exports

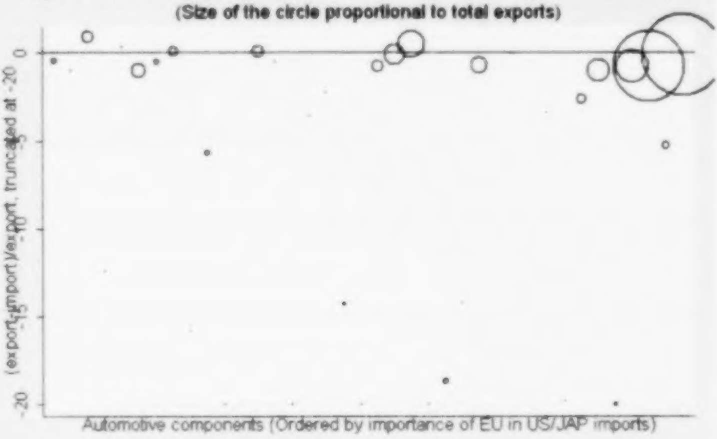
Source: Own calculations based on U.N. Comtrade data set (online)

Figure 1.11 illustrates the size of Canadian trade deficits per component, where components are ranked according to the importance of the E.U. in U.S. and Japanese imports. This ranking is intended to capture the extent to which a component can be considered high tech. The vertical axis represents the trade surplus or deficit: (exports-imports)/exports. The good news is that 90% of Canadian exports are components for which the E.U.'s importance as a source of imports into the other advanced economies is higher than the E.U.'s median importance. The largest circles, which represent the size of Canada's exports, are to the right. This indicates that Canada is specializing in goods in which Europe is a successful exporter to the U.S. and Japan, presumably "high tech" goods. It is also clear that Canada's

exports are highly concentrated. There are only two goods for which Canada is running a sizeable trade surplus, the two largest circles above the zero line. These are non-electrically powered work trucks (the left-most dot) and bumpers, the largest positive observations more or less in the centre. In all electronics, Canada is running a trade deficit.

Figure 11: Net exports by product as a percentage of total exports

(Size of the circle proportional to total exports)



Source: Own calculations based on U.N. Comtrade data set (online)

2. Market analysis: automobiles and light trucks (with Frank Verboven)[9]

This section estimates the potential impact of eliminating MFN tariffs on new vehicles on the production, employment, consumption, and trade of new vehicles in Canada (both short and long-run effect) using cost-benefit and regression analyses (such as estimating the price and substitution elasticity, taking into account quality and reliability differences) with disaggregation by vehicle type to the extent possible. The estimation will be undertaken under two scenarios:

a) Unilateral elimination of Canadian tariffs on new vehicles;
b) Elimination of tariffs on new vehicles in the following five FTA contexts: Canada-South Korea, Canada-E.U., Canada-Japan, Canada-China, and Canada-Mercosur (each of the five separately).

The expected effect of eliminating the 6.1% tariff on final vehicles can be broken down into the following components:

Effect = Benefit – Cost
= Lower price for consumers (1)
+ higher sales of vehicles (2)
+ tariff concessions by trade partners (3)
– lost tariff revenue (4)
– lost FDI (5)
– lower domestic production (6)

Items number 1, 2, 4, and 6 will be addressed in this section[10].

Item number 5 is the subject of the next section.

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[9] All analysis in Section 2 is joint with Professor Frank Verboven from the Catholic University of Louvain in Belgium.

[10] Note that this analysis is limited to final assembly. If Canadian parts are disproportionately oriented towards Canadian vehicle production, the lost production domestically will have a multiplier effect on the parts sector. Given that we do not have any data on this exposure, we merely note this point, but do not come up with an estimate of the effect.

Properly discussing item number 3 would go beyond the automotive industry. We will include some comments about the possible export effects of trade concessions of trade partners on final vehicles in the current section, but reciprocity in the automobile industry is only one of several possibilities.

Throughout, we will have to compare dollar values that represent gains and losses for different groups to obtain an aggregate effect for Canada. When an effect has a non-obvious distributional effect, it will be noted.

The way we will obtain estimates for the quantities outlined above is by estimating a discrete choice model of vehicle choice in the Canadian automobile market. This follows in a recent tradition of using oligopolistic models of competition in differentiated products to study the actual market equilibrium and to conduct counterfactual analysis. The crucial objective is to get an estimate of the primitives of the model, most crucially the demand parameters, but potentially also the parameters that govern the marginal cost function. With estimates for those functions in hand, one can conduct counterfactual simulations how the market equilibrium is expected to change if, for example, a trade policy is changed. The main benefit of such an approach is that we allow all market participants, even those only indirectly affected by the policy change, to update their strategies and we calculate a new Nash equilibrium for the industry. This way one obtains a consistent estimate of the trade policy effect only keeping the primitives constant, not the observed strategies. It leads to an analysis that is robust to the Lucas-critique, which has plagued earlier counterfactual analyses.

We will proceed in three steps. First, in Section 2.1, we formulate and estimate a discrete choice model of vehicle demand. Given the time constraints for this project we estimate a nested logit model using aggregate market shares and model characteristics, including price, at the vehicle-level. In a more elaborate analysis one could allow random coefficients on some of the characteristics, especially price, and add assumptions on the shape of the marginal cost function to estimate a supply equation jointly with demand. In Section 2.2, we outline our estimation strategy.

Second, in Section 2.3, we use the demand model to calculate a number of quantities that are generally unobserved, but which will influence the effect of any policy change. In particular, we will calculate (i) own and cross-price elasticities for each model with respect to all other models in the market; (ii) unobserved vehicle quality, from the point of view of the consumer; (iii) the marginal costs for each vehicle that are consistent with the estimated price elasticities of demand and the observed prices. We do not estimate the supply side of the market directly, as it is not necessary to identify the demand parameters. It could result in more precise estimates and would allow one to impose the condition that firms always set prices on the elastic portion of demand, as theory implies. We will test how frequently this last condition is violated if it is not imposed. To calculate the elasticities and marginal costs we will assume that firms are playing a Bertrand price-setting game in differentiated products. We will take explicitly into account that firms that produce multiple models will internalize the effects of a price change of one model on the sales of all their other models.

Third, using the estimated demand parameters, price-elasticities, and marginal costs we conduct counterfactual simulations of market equilibrium—in Section 2.4. In particular, we look at the impact of elimination of the 6.1% import tariff on non-NAFTA vehicles. This will take the form of a reduction in the marginal costs for the affected importers by 5.75% (as the calculated marginal cost includes the current tariff rate). Different scenarios for the extent of trade liberalization will change the models which are affected[11]. We calculate a number of summary statistics in each scenario to illustrate the impact on prices, mark-up, sales, production, profits, consumer surplus, tariff revenue, and the differential impact on domestic producers and importers[12].

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[11] Note that a few models produced in the U.S. do not meet NAFTA content requirements, e.g. the BMW X5 and the Mercedes-Benz M-class SUVs. We will not consider trade liberalization that eliminates this content requirement because it would severely complicate the analysis. While this is strictly speaking not consistent with full trade liberalization, one of the scenarios considered, these models are sold in sufficiently small quantities that we are confident it has only a marginal impact on the results.

2.1 Specifying a model of demand

The automobile industry has proved to be a popular proving ground for discrete choice models that estimate demand for differentiated products. The state-of-the-art in estimating aggregate demand is the random coefficients model discussed in Berry (1994) and first taken to the data (U.S. automobile purchases) in Berry, Levinsohn, and Pakes (1995). Micro-level data, as in Goldberg (1995) or Berry, Levinsohn, and Pakes (2004), can be used to obtain more precise parameters. An intermediate solution, in Petrin (2002), adds micro-moments to the aggregate estimation. Several studies have used these models to evaluate trade policies. Important recent studies that use aggregate data include Irwin and Pavcnik (2004) for airlines and Fershtman and Gandal (1998), Berry, Levinsohn, and Pakes (1999), Brambilla (2005), Brenkers and Verboven (2006) for automobiles. Section 2.5 contains a (non-exhaustive) list of papers that use discrete choice models to estimate the demand for automobiles. No estimates for Canada are currently available.

We will use a nested logit model; see Anderson and De Palma (1992) and Verboven (1996a) for details and Berry (1994) for a comparison with the general framework. This model can be interpreted as a restricted random coefficients model, see Cardell (1998), where consumers share the valuation on all the observable characteristics, except on a set of nesting dummies that segment the market.

Consider the Canadian automobile market where I consumers are considering to purchase a car or light truck. They can choose between J available models, one of which is the outside good, i.e. purchasing a second hand vehicle or postponing the

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[12] Note that we have explicitly chosen not to calculate employment effects. As the results will make clear, quantity changes are relatively small. It would be entirely arbitrary to map these small quantity changes in employment changes because production is organized in large scale plants and indivisibilities matter.

purchase. The utility of the outside good purchase will be normalized to zero[13]. A consumer *i*'s conditional indirect utility function from purchasing product $j = 1 \ldots J$ that belongs to nest/segment *g* is given by:

$$
\begin{aligned}
u_{ij} &= \underbrace{\sum_{k=1}^{K} x_{jk}\beta_k + \xi_j - \alpha p_j}_{\delta_j} + \xi_{ig} + (1-\sigma)\varepsilon_{ij} \\
&= \delta_j + \sum\nolimits_g d_{jg}\xi_{ig} + (1-\sigma)\varepsilon_{ij}
\end{aligned}
$$

Utility thus consists of a component that is common to all consumers (δ_j) which groups together the first three terms, a random taste of consumer *i* for vehicles in segment *g* (which can be positive or negative), and an individual-model specific random utility draw (ε_{ij}). The common part (δ_j) depends on K observable characteristics that each consumer values identically (fuel-efficiency, horsepower, size, etc.), a model-specific unobservable characteristic (combining the effect of style, advertising, etc.), and price—the only endogenous characteristic (which has a negative coefficient attached to it). The benefit of such a modeling strategy versus specifying a traditional demand system at the product level is that with only a few parameters we are able to generate cross-price derivates between all models that are very general. Note that in 2005 a total of 238 different models were sold in the Canadian market. Specifying the demand directly would require an extraordinary amount of parameters to allow for flexible substitution patterns.

We assume that the distribution of the random utility term (ε_{ij}) follows the extreme value distribution, such that we can derive market shares in analytical form; for more details on the nested logit model see Anderson and De Palma (1992) and

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[13] Note that to define market shares we have to define the potential market of consumers. With only two years of data, this decision is entirely inconsequential; it merely scales the market shares. We choose the number of Canadian households as our measure of *I*, which gives an market share for the outside product of almost 80%.

Verboven (1996a). We further assume the market can be partitioned into G exclusive and exhaustive segments. Each segment contains J_g models and $\sum_g J_g = J$. Each consumer will choose one model to maximize her utility.

The nested logit distributional assumptions on the random utility term yield the following choice probability for individual i for product j that belongs to segment h as a function of the entire $Jx1$ price vector:

$$s_{ij}(p) = \frac{\exp((\delta_j - \alpha p_j)/(1-\sigma))}{\sum_{l=1}^{J_h} \exp((\delta_l - \alpha p_l)/(1-\sigma))} \cdot \frac{\exp(I_h/(1-\sigma))}{\sum_{g=1}^{G} \exp(I_g/(1-\sigma))}$$

where

$$I_g = (1-\sigma)\ln \sum_{l=1}^{J_g} \exp((\delta_l - \alpha p_l)/(1-\sigma))$$

is called the 'inclusive value' for segment $g = 1 \ldots G$. The predicted aggregate market share for model j is obtained by averaging the choice probabilities over all individuals, which in our (simple) case is simply $N.s_{ij}$ because our choice probabilities are not individual-specific[14].

The nested logit model will result in higher elasticities of substitution between models in the same segment than across segments, which is a major improvement over the simple logit model. An unattractive feature is that the own-price elasticity of substitution for each model will be increasing in price. This will be discussed at length in the next section.

The model can be generalized in a variety of ways. Two approaches to add flexibility to the estimated own-price elasticities is to let the parameter that governs the degree of substitution within

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[14] In the full random coefficients model, see Berry (1998), the market shares cannot be derived analytically because the choice probabilities vary by consumer. As a result, a simulation estimator has to be used and the unobservable quality term has to be calculated using an embedded contraction mapping. Both of these complications severely increase the computational burden.

nests (σ) vary by segment. If demand elasticity is higher for cheap small cars than for expensive luxury cars, it would show up as a higher σ parameter in the small car segment; see Brenkers and Verboven (2006) for an illustration on the European car market. In order to estimate this model we would require more data than we currently have. The severe time constraints on this project necessitated us to estimate a relatively simple model[15].

An alternative would be to introduce (more) random parameters to the model, which would allow different individuals to value the characteristics differently. The most direct way to obtain more realistic demand elasticities would be to let the coefficient on price to vary by income level. By simulating a sample of consumers with income levels drawn from the national income distribution, we can calculate the choice probabilities at a more disaggregate level. However, working with individual-specific choice probabilities would greatly increase the computational burden on the estimation because closed form solutions would not exist anymore and a fixed point iteration would be required to uncover the unobserved model characteristics. Berry, Levinsohn, and Pakes (1995) outline the approach.

2.2 Estimating the demand model

We estimate the nested logit model introduced in the previous section using seven nests: small cars, mid-size and large cars, luxury cars, compact and mid-size SUVs, large and luxury SUVs, minivans, and pickup trucks. We collected data on each model for sale in the Canadian market in the 2004 and 2005 model years[16]. Dropping all models that sell less than 200 units per year gives us a sample of 442 observations, 218 in 2004 and 224 in 2005. We have renamed some 2004 models because the replacement models were introduced under a different name, even though they are

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[15] With only two years of data available, the substitution parameters σ for some of the nests were estimated to be (insignificantly) larger than unity, which violates the theory. Therefore, we forced them to be the same across nests.

[16] The model year runs from September 1 to August 31. This will avoid including observations in the sample where a vehicle is only sold for part of the calendar year.

clearly replacing an existing car in their segment. This affects only the estimates that use random (or fixed) effects.

Table 2.1 Summary statistics for Canadian (domestic) market

	Average	**Standard Deviation**	**Minimum**	**Maximum**
Price ($)	37,480	20,403	12,995	131,300
Sales (units)	7,030	10,919	203	70,853
Model characteristics:				
Hp/weight	0.551	0.135	0.249	1.262
Size (l x w x h)	0.882	0.220	0.357	1.452
Miles/$	2.322	0.819	0.952	7.048
Automatic	0.554	0.498	0	1
Foreign brand	0.567	0.497	0	1
Production location (for vehicles sold in Canada):				
Canada	10.3%	30.4%		
U.S. & Mexico	48.2%	50.1%		
E.U.	17.0%	37.6%		
Japan	15.6%	36.4%		
South Korea	8.9%	28.6%		
Segment:				
small car	14.3%	35.1%		
middle car	18.8%	39.1%		
upper car (large & luxury)	18.3%	38.8%		
lower SUV	17.9%	38.4%		
upper SUV (large & luxury)	13.8%	34.6%		
minivan	8.9%	28.6%		
pickup	8.0%	27.2%		

As explanatory variables, we follow most closely the papers by Berry *et al.* (1995) and Petrin (2002). The following variables are included: power is captured by horsepower per weight, size by length x width x height, and fuel efficiency by miles per dollar. We include a dummy variable that indicates whether an automatic transmission is part of the standard equipment as a measure of luxury; and a dummy whether the nameplate has traditionally been owned by a domestic producer. Note, for example, that this latter variable is zero for the North-American produced Honda Civic—as Honda still tends to be perceived as a foreign car company. Similarly, all Volvos are foreign even though they are now owned by Ford and all Chevrolets are labelled domestic, even though some are manufactured by GM Daewoo in South Korea. Summary statistics are in Table 2.1.

Table 2.2 Demand coefficient estimates

	Dependent variable: logarithm of market share (relative to outside good)			
	OLS	**Nested logit**	**Nested logit with IV**	**Nested logit with IV and RE**
	(1)	**(2)**	**(3)**	**(4)**
Price	-0.037	-0.025	-0.052	-0.051
	(.003)***	(.001)***	(.003)***	(.004)***
Hp/weight	0.178	-0.198	1.648	0.823
	(0.511)	(0.220)	(.347)***	(.213)***
Miles/$	0.273	0.216	0.089	-0.003
	(.107)**	(.046)***	(0.065)	(0.061)
Size	1.196	0.075	0.454	-0.005
	(.443)***	-0.194	(.270)*	(0.222)
Automatic	-0.446	-0.026	0.203	0.177
	(.132)***	(0.058)	(.094)**	(.074)**
Domestic	-0.373	-0.133	0.050	0.020
	(.117)***	(.051)***	(0.077)	(0.092)
Nesting variable		0.859	0.693	0.698
		(.020)***	(.064)***	(.090)***
Year	0.000	0.054	0.037	0.020
	(0.102)	(.044)	(0.060)	(0.019)
Constant	-7.582	-3.580	-4.526	-3.474
	(.707)***	(.318)***	(.504)***	(.523)***
Observations	441	441	441	441
Adj. R^2	0.412	0.891	0.802	0.822

Notes: * Significant at the 10% level, ** at 5%, *** at 1%.

Parameter estimates for the demand system, using several estimation methodologies, are in Table 2.2. The simple least squares estimates, results in column (1), indicate that people positively value more engine power, greater fuel efficiency and a larger size. Contrary to expectation, a standard automatic is valued negatively and the willingness to pay for domestic cars is significantly lower than for foreign cars. Not surprisingly, consumers prefer paying a lower price, although the point estimate on the price variable is relatively low. Such a low coefficient estimate, -0.037, would indicate pricing on the inelastic portion of demand for a number of models, which is inconsistent with profit maximizing behaviour.

Coefficient estimates for the nested logit model, in column (2), are largely similar. Only the willingness to pay for horsepower turns negative as well, although insignificant. The parameter on the nesting variable is estimated to be positive and below one, in line with economic theory. The implication is that the cross-elasticity of price for models in the same nest is significantly higher than between models in different nests. This captures that consumers are more likely to substitute between models in the same nest; i.e., the segment classification that the industry usually employs makes economic sense. More worrying is the even lower estimated price coefficient than in the first column.

While the low estimates for the price coefficient, and the low demand elasticities this implies, are economically unappealing, they make perfect sense econometrically. The vehicle characteristics included in the model only capture a limited number of dimensions consumers care about. As a result the error term will include the effect of unobservables that consumers value and are willing to pay for (the ξ_j parameters in the model). Firms with price-setting power are likely to put a higher price on vehicles that have higher unobservable "quality".

This endogeneity will induce a positive correlation between price and the error term and lead to an upward bias on the price coefficient. In some applications, not taking this effect into account even leads to an upward-sloping demand curve. Expanding the number of observable characteristics will help, but it would be impossible to include every characteristic consumers care about. The attractiveness of the design, a good layout of the dashboard, or reliability are only some of the characteristics that are hard to measure reliably. As a result, we will use instrumental variables to control for price setting.

We require variables that are unlikely to be correlated with unobservable aspects of a vehicle's "quality", broadly defined, but are correlated with the price. For a detailed discussion of instruments in this literature, we refer to Berry *et al.* (1995). We basically follow their insight and use as instruments the average characteristics for competing manufacturers. The observable characteristics of vehicles produced by competing firms are plausibly exogenous to the unobserved quality that consumers attach to the vehicle of one firm, while in a competitive market setting these characteristics will definitely influence the pricing decision of the firm. The discussion in Berry *et al.* (1995) includes conditions under which these instruments resemble optimal instruments. In the nested logit setting, we include two sets of instruments: average characteristics of all models produced by other firms and the same set of variables but only averaging over competing models in the same segment. Adding this second set of instruments changes the point estimates of the coefficients only marginally but improves estimation precision.

Results for the nested logit model with instrumental variables for price are in column (3) of Table 2.2. This will be the preferred set of estimates that we will use to simulate the model. The coefficient on price changes a lot. It almost doubles in absolute value—in line with the expected increase. As a result, for virtually all models in the market we find that firms are setting the price on the elastic portion of demand—in line with profit maximizing behaviour. Consumers now have a positive marginal willingness to pay for all characteristics—also as expected. The power of the engine, a standard automatic transmission[17], and vehicle size are found to be most important. Fuel efficiency and a domestic nameplate both have a positive effect on demand, but are not significant at usual significance levels. Finally, the nesting variable is still estimated to be large and positive, albeit not as large as with OLS. Firms in the same nest seem to resemble each other also in terms of unobservables, which is plausible.

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[17] Using other variables to measure luxury, such as standard ABS or models explicitly marketed in luxury segments, leads to similarly positive estimates.

Finally, in column (4), we also report instrumental variables estimates of the nested logit model allowing for random effects by model, to control more explicitly for unobservables[18]. These estimates provide a robustness check for the results when we control more generally for model-specific time-invariant heterogeneity. Especially, the price coefficient (α) and nesting variable (σ) are estimated extremely similar. These are the only two parameter estimates that explicitly enter the elasticity calculation (see below). As a result, own and cross-price elasticities would be very similar for the model in column (4). The coefficient on size can hardly be identified anymore, which is not surprising as this is one characteristic that manufacturers can hardly change in successive model-years.

2.3 Calculating unobserved variables

The coefficient estimates for the demand parameters in column (3) of Table 2.2 are now used to calculate the demand elasticities, marginal costs, and unobserved vehicle quality. The first two will drive the results of the trade policy simulations in the next section[19].

The demand system yields own and cross-price elasticities for all 218 vehicles for sale in Canada. A benefit of the random utility framework is that it allows a general pattern of substitution, while requiring only the estimation of a limited number of coefficients—those associated with vehicle characteristics and the degree of substitution within each nest. As mentioned earlier, for a truly flexible substitution pattern one has to allow for more random coefficients than only on the segment dummies, e.g., on price.

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[18] Alternatively, we could estimate the model with fixed effects, but more than two years of data would be required. The random effects can be incorporated even with the limited data set we have to work with.

[19] From now on we focus on the results for 2005.

In the one-level nested logit model, the demand elasticities are:

$$\varepsilon_{jj} = -\frac{\partial q_j}{\partial p_j}\frac{p_j}{q_j} = \alpha p_j\left[\frac{1}{1-\sigma} - \frac{\sigma}{1-\sigma}\frac{q_j}{Q_g} - \frac{q_j}{L}\right] \qquad j \in \text{nest } g$$

$$\varepsilon_{jk} = \frac{\partial q_k}{\partial p_j}\frac{p_j}{q_k} = \alpha p_j\left[\frac{\sigma}{1-\sigma}\frac{q_j}{Q_g} - \frac{q_j}{L}\right] \qquad \text{both } j \text{ and } k \in \text{nest } g$$

$$\varepsilon_{jk'} = \frac{\partial q_{k'}}{\partial p_j}\frac{p_j}{q_{k'}} = \alpha p_j\left[\frac{q_j}{L}\right] \qquad j \in \text{nest } g, k' \in \text{nest } g' \neq g$$

Table 2.3 Own and cross-price elasticities for a select number of models

	Civic	**Mazda3**	**Pursuit**	**Elantra**	**Golf**	**Escape**	**CR-V**	**Santa Fe**	**Equinox**
Civic	-2.499	0.254	0.254	0.254	0.254	0.009	0.009	0.009	0.009
Mazda3	0.195	-2.574	0.195	0.195	0.195	0.007	0.007	0.007	0.007
Pursuit	0.137	0.137	-2.570	0.137	0.137	0.005	0.005	0.005	0.005
Elantra	0.062	0.062	0.062	-2.487	0.062	0.002	0.002	0.002	0.002
Golf	0.029	0.029	0.029	0.029	-3.121	0.001	0.001	0.001	0.001
Escape	0.004	0.004	0.004	0.004	0.004	-3.680	0.229	0.229	0.229
CR-V	0.004	0.004	0.004	0.004	0.004	0.210	-4.584	0.210	0.210
Santa Fe	0.002	0.002	0.002	0.002	0.002	0.121	0.121	-3.448	0.121
Equinox	0.003	0.003	0.003	0.003	0.003	0.152	0.152	0.152	-4.372

Note: The statistics indicate the demand elasticity of the model in column for price changes of the model in the column. Own price elasticities are on the diagonal.

We calculate the own and cross-price elasticities between all models—*J*(J+1)/2* elasticities (23871 elasticities in 2005)—as they are used to uncover the marginal costs the model implies. Table 2.3 lists the own and cross-price elasticities for a select number of vehicles from the two largest Canadian market segments. For each region of the world[20]—Canada, U.S. and

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[20] These five regions will be considered separately in the trade policy simulations below.

Mexico, South Korea, Japan, and the E.U.—we include the best-selling vehicle. The first five models are from the "small car" segment, which combines the lower small, upper small and small specialty cars according to the market segmentation in Ward's Automotive Yearbook. The next four models are "small SUVs", a nest that combines the small and middle SUVs and small and middle cross-utility vehicles (car-based SUVs) segment[21].

A crucial—and admittedly undesirable feature—of the nested logit demand model is that within each nest the absolute value of the own-price demand elasticity is an increasing function of a model's price. This follows directly from the functional form for demand. Within each segment, all vehicles share the same demand curve, except for the random individual-model specific logit error draw. As a result, more expensive models will be priced higher up on the demand curve, where consumers are more elastic.

The cross-model elasticity of substitution is much higher for models in the same nest, driven by the high estimate for σ, and the elasticity of substitution between models in all other nests is the same. Ideally, we would let the added substitutability within each nest vary and estimate seven distinct σ parameters. Brenkers and Verboven (2006) illustrate that with such added flexibility substitution parameters in more expensive segments tend to be lower and own-price elasticities do not have to rise with price. However, given that we only have two years of data available, several of the estimated σ parameters were estimated higher than 1, although not significantly so, which is inconsistent with a well-behaved demand system. Therefore, we were forced to impose similarity of the σ parameter in each nest and as a result demand elasticities increase with price throughout. A factor that exacerbates this tendency is that more expensive segments in Canada tend to be more crowded, increasing demand elasticities further. The elasticity formula

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[21] In the market segmentation followed in DesRosiers publications for Canada, "small cars" refers to subcompacts, compacts, and smaller sport cars, "small SUVs" would refer to compact SUVs, SUVs, and intermediate SUVs.

clearly indicates that own-price elasticity is increased if a vehicle has only a low market share within its segment.

The model does perform well in predicting different cross-price elasticities for models that are in the same segment and those that are not. For example, a 10% price increase for the Honda Civic, the most popular model, raises the expected sales of all other small cars by 2.54%. The effect on models in all other segments, including the outside good (i.e. second hand cars), is much smaller, a 0.9% sales increase. A similar price increase for the Mazda3 leads to only a 1.95% sales increase for other models in the small car segment. The difference is explained by the fact that the Mazda has only ¾ of the sales of the Civic, so given that the own-price elasticity is similar (-2.574 versus -2.499) the number of lost Mazda sales that spill over to competitors is proportionally lower.

In the consumer's random utility function is an unobservable model-specific characteristic (ξ_j) that directly enters the (normalized) market share function linearly—in our estimation it becomes the error term of the regression. This is the next quantity that can be calculated from the fitted demand model. While it will not play an independent role in the results, since results only depend on the joint effect of the entire part of the utility function that is common to all individuals' valuation (δ_j), it provides a useful check for plausibility of the model estimates. The average ξ_j is zero for the entire sample, but to aid comparability we normalize it to zero by segment. Vehicles with positive ξ_j have a higher demand than one would predict based on the observable characteristics. As such, it measures the unobservable "quality" of the vehicle.

Table 2.4 contains the name, production region, sales, and price of the same select group of vehicles that were included in Table 2.3. To give some idea about the relative position in their segment, their sales rank is also included[22]. The next column lists the unobserved "quality" of the vehicle, which by and large corresponds to our priors. The Honda Civic and Mazda3 record positive unobserved quality, indicating that their sales are higher than one would expect based on the observable characteristics included in the demand estimation. In the case of the Civic, high resale value springs to mind, and for the Mazda3 the original new design can be noted. The Pontiac Pursuit, on the other hand, has a large negative quality. It indicates that the model would be expected to sell in much higher numbers, especially given its low price, strong engine, and large size.

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[22] For the small SUVs, I did not include the sales leader, the Pontiac Montana SV6 because it was newly introduced in 2005.

Table 2.4 Calculated unobservables for a select number of models

	produced	Sales	rank in segment	price	unobserved "quality"	marginal cost	mark-up
Honda Civic	Canada	63676	1	16200	0.523	9697	0.401
Mazda3	Japan	48576	2	16295	0.321	9616	0.410
Pontiac Pursuit	U.S. & Mex.	34852	4	15925	-0.823	8513	0.465
Hyundai Elantra	South Korea	16711	11	14994	-0.010	8655	0.423
Volkswagen Golf	E.U.	6258	21	18530	0.095	12428	0.329
Ford Escape	U.S. & Mex.	21466	2	22995	0.324	16239	0.294
Honda CR-V	Japan	16019	3	28200	0.266	21872	0.224
Hyundai Santa Fe	South Korea	12383	5	20995	-0.155	14589	0.305
Chevrolet Equinox	Canada	12291	6	26614	0.119	19042	0.285

Note that in absence of actual transaction prices we use MSRP as the price. The domestic manufacturers tend to discount their selling price more than imports. As a result, the unobservable quality that would be imputed for the Pontiac Pursuit if actual prices would be available would likely be even lower. It would be preferable to use transaction prices instead of MSRP, but data limitations make this impossible[23]. Another notable pattern is that both Korean entries in Table 2.4 have a below average imputed unobservable quality. Sales for these models are lower

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[23] Note that J.D. Power collects transaction information for the U.S., but the cost of these data far exceeds the budget for this study.

than expected, especially given their attractive low price. This coincides with the general perception that although the quality of the Korean cars and SUVs has improved spectacularly over the last decade, they have not closed the gap with their Western or Japanese competitors entirely. Because we only included relatively successful vehicles in Table 2.4, average quality tends to be high. Vehicles ranked much lower in their segment tend to have lower imputed quality as well—partly as explanation of their poor sales performance.

Once we add a first order condition for price setting to the estimates of the demand system, we can uncover what marginal costs for each vehicle have to be to rationalize the observed prices. We assume that firms compete in prices and that observed prices are at equilibrium in a differentiated products (Bertrand) pricing game. Moreover, firms are explicitly modeled as multi-product firms, taking into account the effect of the price of each model on all the other models they own[24]. For a derivation of the first order condition, we refer the interested reader to Berry (1994) or Berry, Levinsohn, and Pakes (1995). The imputed marginal costs for a select group of vehicles are in the second last column of Table 2.4.

Finally, the mark-up on each vehicle, defined as $\frac{p_j - mc_j}{p_j}$ is in the last column. Note that we have explicitly incorporated multi-product behaviour by the firms. The effects can be seen by comparing the mark-up on the Pontiac Pursuit and the Hyundai Elantra. While the marginal costs of both vehicles are similar, GM chooses to put a much higher mark-up on the Pontiac. The reason is simply that 9 of the 32 models in the small car segment are owned[25] by GM and it takes into account that lowering the Pontiac's price will to a large extent merely cannibalize the sales

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[24] We aggregated brands into corporate groups—denominated by "firms" in the paper. For example, even though Ford does not own Mazda outright, we assume their ownership share gives Ford enough influence to make sure externalities of Mazda pricing on Ford vehicles are included in Mazda's decision making. Table 2.9 below contains a list of the "firms" in the market.

[25] In light of the previous footnote, "owned" should really be interpreted as "controlled", as it includes Suzuki vehicles.

of its other offerings in the segment. The substitution patterns in Table 2.3 illustrate clearly that the bulk of cross-model substitution happens within each segment. The same reasoning explains the similar mark-up between the Chevrolet Equinox and the Hyundai Santa Fe in the small SUV segment, even though the estimated marginal cost for the Chevy is $4,500 higher.

The much smaller mark-ups for the small SUV segment versus the small car segment results from the higher average price for SUVs combined with the restrictive functional form assumption for demand. Given that the substitution patterns within each segment dominate and that prices are relatively similar within each segment, the impact of this on the trade policy simulations is likely to be second order as cross-product substitutions are not affected by this.

We now have all the ingredients—a demand system, imputed marginal costs for each model, and a market equilibrium assumption—to turn to the counterfactual policy experiments.

2.4 Simulating trade policy changes

In this section, we rely on the previously discussed results to perform four counterfactual policy simulations. We look at the impact of four trade policy changes on a number of important economic variables. The policy changes for Canada that we consider are:

- FTA (only) with South Korea
- FTA (only) with Japan
- FTA (only) with the E.U.
- Unilateral abolition of the Canadian import tariff on final vehicles

Currently, Canada imposes a 6.1% import duty on finished vehicles. In each of these four scenarios we will investigate how the market equilibrium would look differently if vehicles imported from one or more countries would be exempt from the import duty. A number of caveats are in order before we turn to the discussion of the results:

1. We do not consider domestic content requirements in this exercise. It is likely that any FTA agreement would specify domestic content rules, much like those in force under

NAFTA. We simply assume that all relevant firms would (costlessly) be able to satisfy those rules[26].

2. One should not interpret the results as a prediction of the likely future effects of such trade policy changes. We calculate what the market equilibrium would have looked like in 2005 if an alternative trade regime would have been in effect.
3. The results do take into account responses of only indirectly affected firms. The competitive situation and hence the optimal prices for domestically produced vehicles will differ if one or more importers are suddenly exempt from import duties. We let all market participants adjust to the new situation. Hence, our results should be interpreted as long-term effects.
4. We only vary the marginal costs of firms for which the import regime changes—as they do not have to pay duties anymore. In order to impute the marginal costs that rationalize the observed price vector, we had to assume marginal costs are constant, i.e. do not vary with output[27]. As such, the only thing that changes for domestic producers is the degree of competition.
5. The effects of the newly opened Hyundai plant in Alabama and the Toyota plants under construction in Texas and Baja California are not incorporated yet into this analysis.
6. With our model we are able to analyze the domestic Canadian market. We will study the impact of trade policy on sales, pro-

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[26] As noted earlier, in the last two policy simulations we do not modify the duty treatment of the vehicles assembled by BMW or Mercedes-Benz in the U.S. Currently these vehicles do not satisfy the NAFTA domestic content requirements and incur duties when imported into Canada. Under an FTA with Europe or under unilateral free trade by Canada it would be reasonable to assume these vehicles would also be exempt from duty (as their joint E.U./NA domestic content will far exceed any plausible threshold). It would have been too time consuming to adjust our simulation programs to take this into account. Note that only 5000 vehicles annually are affected by this shortcoming, a mere 0.3% of the Canadian market.

[27] This assumption is made throughout in the literature. Relaxing it would directly affect all firms' first order conditions and severely complicate the calculation of a new equilibrium.

duction, imports, prices, mark-ups, profits, consumer surplus, and tariff revenue. We will break down the impact by the origin of production—produced in Canada or imported from one of the four other regions. However, we do not look at total Canadian production. Demand in other countries is unlikely to be affected in any important way by a change in Canadian import tariffs. As a result, Canadian production for export is assumed to remain unchanged. Furthermore, we cannot discuss the impact of an FTA with China or Mercosur, because that would be mere speculation at this point—how to know the elasticity of substitution between a Dodge Caravan and a not-yet-introduced Chinese-made vehicle?[28]

With these caveats in mind, we now turn to the results from the trade policy simulations. The actual and predicted levels of all economic variables are in Table 2.5. The four different policy changes are reported in the different columns. Table 2.6 contains the same results, but shows all effects as percentage changes relative to the 2005 baseline case. First, we discuss our calculations by introducing the results for the actually observed market equilibrium in 2005.

2.4.1 The baseline case: 2005 Canadian automobile market

The actual quantities of all the relevant economic statistics for 2005 are in the first column of Table 2.5. The average quantity-weighed price was just over $25,000. The average mark-up, again weighted by sales, was 31.1% which implies that the average marginal cost was $19,124. Note that this marginal cost excludes all fixed costs involved in making, marketing, and selling a vehicle: designing the vehicle, building and maintaining an assembly plant, retooling all capital equipment, all advertising and marketing expenses that are independent of the actual number of cars sold, fixed costs of maintaining a dealership network, etc.

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[28] In Section 4, when we study automotive components, those regions will be studied.

The average price of vehicles produced in Canada is $822 below the national average, while the average American- or Mexican-made vehicle is $591 more expensive than the national average. Not surprisingly, the average European import is much more expensive—at $41,728—and the average Korean import much cheaper—at $17,678—while Japanese vehicles most closely resemble Canadian vehicles. In line with the earlier discussion, we find again that more expensive vehicles are associated with lower mark-ups. Note that throughout we will use the term Canadian vehicles for vehicles produced in Canada, including foreign nameplates such as the Honda Civic or Lexus RX220. Korean vehicles, on the other hand, will include vehicles badged by Hyundai and Kia, but also some Chevrolets and Suzukis. In the same spirit, Canadian profits are meant to indicate all variable profits made on vehicles produced in Canada, irrespective of the owner.

Total sales in Canada in 2005 amounted to almost 1.6 million vehicles, cars and light trucks combined; more than ¼ of these vehicles were assembled domestically[29]. Of course, the vast majority of cars assembled in Canada are exported, but as mentioned earlier, we assume Canadian exports are unaffected by trade policy changes and do not discuss them further. Canadian imports total 1.17 million and just over 2/3 of these come from the U.S. or Mexico, entering the country duty-free under NAFTA. The market share of cars made in Japan is 11.3%, which translates into a Japanese import share of 15.2%. For South Korea, the comparable statistics are 8.6% and 11.5% and, for the E.U., market and import shares are 4.5% and 6.0% respectively. Note that these shares differ from those in Table 2.1 as the model characteristics in that table are not weighted by sales volumes[30].

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[29] Total Canadian sales of models that are produced in a Canadian assembly plant (and possibly in other plants as well) adds up to 401,292 units for the 2005 model year. Note that total production of these models is much higher as the majority of output is exported. Note also that actual domestic sourcing of Canadian-made vehicles is bound to be lower as firms produce some of their highest volume vehicles in a second assembly plant in the U.S. As actual configurations produced differ between plants, some Canadian demand for a vehicle produced domestically will be filled by U.S. plants. For example, in 2005 DaimlerChrysler sold 216,857 vehicles in Canada, 34,979 of these were produced locally. Total sales in Canada of the Dodge Caravan, produced in Windsor and St. Louis, exceeded 60,000. Similar problems exist for GM (Canadian demand of the Chevrolet Silverado and GMC Sierra, produced in Oshawa, exceeds their "total Canadian production for sale in Canada". For Honda (Civic) and Toyota (Corolla), the problem exists as well, but it is not as large. In absence of information at the model level of the final destination of vehicles, we are forced to use the definition of Canadian production we adopted.

Converting the implied consumer surplus into a dollar amount using the estimated price coefficient yields a surplus of $33.8 billion—or an average of almost $29,000 per sold vehicle. This is the aggregate utility value over and above the sales price consumers attach to their new vehicle purchases. This implausibly high estimate is due to the fact that consumers get vehicle-specific draws in their utility function and, as a result, people tend to buy cars that give them a high utility level for factors mostly unexplained by the model. While this is a major problem investigating the introduction of new goods, see Petrin (2002), in the current application we do not change the range of models for sale in the market. While the level of the surplus is likely to be unreliably estimated, we will only look at changes. Aggregate variable firm profits are on the order of $11 billion, 26.7% of which are earned on vehicles made in Canada—approximately in line with the Canadian production share. Note, once again, that these are variable profits and that they include all the fixed costs firms incur. They are entirely incomparable to the accounting profits that firms have to report. Given that fixed costs are, by definition, fixed, we can still use the profit measure to get a reliable estimate of how trade policies will affect firms' profitability.

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[30] While only 10% of the observations are models produced in Canada, they represent 25% of sales.

Table 2.5 Trade policy simulations: levels (model year 2005: Sept. 2004 – Aug. 2005)

	Actual situation in 2005	FTA with:			Unilateral elimination of Canadian tariff
		South Korea	Japan	E.U.	
Aggregate effects on:					
Price (average)	$25,134	$25,045	$25,066	$25,372	$25,210
Mark-up (average)	31.3%	31.5%	31.4%	31.2%	31.5%
Demand	1,574,635	1,578,561	1,583,037	1,581,758	1,593,770
Canadian production	401,292	399,155	397,500	398,327	392,624
Imports (NA + ROW)	1,173,343	1,179,406	1,185,537	1,183,431	1,201,146
Consumer surplus (mil.)	33,819	33,914	34,022	33,991	34,283
Firm variable profits (m)	11,034	11,053	11,071	11,078	11,131
Firm profits in Canada	2,948	2,930	2,920	2,926	2,881
Tariff revenue	426	333	235	270	
Domestic welfare (mil.)	37,193	37,177	37,177	37,187	37,164
Effects, broken down:					
Prices					
- Canada	$24,312	$24,314	$24,304	$24,256	$24,253
- U.S. & Mexico	$25,725	$25,732	$25,673	$25,598	$25,559
- South Korea	$17,678	$17,343	$17,648	$17,674	$17,309
- Japan	$23,505	$23,504	$23,603	$23,262	$23,343
- E.U.	$41,728	$41,774	$41,546	$44,016	$43,913
Mark-ups					
- Canada	32.4%	32.4%	32.4%	32.4%	32.4%
- U.S. & Mexico	29.9%	29.9%	29.9%	30.0%	30.0%
- South Korea	40.7%	41.7%	40.7%	40.7%	41.6%
- Japan	33.1%	33.1%	33.3%	33.3%	33.4%
- E.U.	18.9%	18.8%	18.9%	18.8%	18.8%
Quantities					
Canada (production)	401,292	399,155	397,500	398,327	392,624
U.S. & Mexico (import)	789,553	784,260	779,134	782,880	767,776
South Korea (import)	135,378	148,538	133,259	134,913	145,769
Japan (import)	178,319	176,753	205,255	175,698	200,315
E.U. (import)	70,093	69,855	67,889	89,940	87,285

Finally, we can also calculate the government's tariff revenue from imported vehicles. The model does not provide us with the import value of the vehicle that we can use to calculate the duty on. In absence of any other plausible magnitude, we use the estimated marginal cost for each vehicle as base to calculate duties (on average, across all vehicles, marginal cost is 70% of the final consumer price). While this excludes some of the fixed costs likely to be subject to tariffs, it includes any costs incurred in the distribution channels which should be excluded. Overall, we are not likely to misestimate tariff revenue by much and in addition, we are mostly concerned with changes over time. In 2005, our assumption leads to Canadian tariff revenue of $426 million, or just above $1000 per imported vehicle on average—note that vehicles imported from the U.S. or Mexico are excluded from duties.

Our measure of domestic welfare in the final goods sector of the industry is the sum of consumer surplus, profits earned on vehicles assembled in Canadian plants, and the government's tariff revenue.

2.4.2 FTA with South Korea

In the second column of Table 2.5, the relevant statistics are reported calculated from a new industry equilibrium where Korean imports are not subject to the 6.1% import tariff anymore. The first column of Table 2.6 contains the same results, expressed as changes from 2005. For the discussion, we will focus on Table 2.6[31].

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[31] These statistics are calculated by computing a new price equilibrium from the vector of first order conditions for all firms. Bresnahan (1987) contains a very clear discussion of the derivation of the first order condition for multi-product firms. The marginal costs for Korean-made vehicles are lowered by 1/1.061 and using a contraction mapping the new price vector is calculated. Note that all elasticities and cross-price elasticities enter the first order conditions and influence the calculated price change. From the estimated demand system we can then calculate all new quantities, profits, trade flows, profits and consumer surplus.

Table 2.6 Trade policy simulations: changes

	FTA with:			Unilateral elimination of Canadian tariff
	South Korea	Japan	E.U.	
Aggregate effects on:				
Price (average)	-0.35%	-0.27%	0.95%	0.30%
Mark-up (average)	0.16%	0.07%	-0.09%	0.11%
Demand	0.25%	0.53%	0.45%	1.22%
Canadian production	-0.53%	-0.94%	-0.74%	-2.16%
Imports (NA + ROW)	0.52%	1.04%	0.86%	2.37%
Consumer surplus	0.28%	0.60%	0.51%	1.37%
Firm profits	0.17%	0.33%	0.40%	0.88%
Firm profits in Canada	-0.61%	-0.96%	-0.77%	-2.29%
Tariff revenue	-21.83%	-44.84%	-36.62%	-100.00%
Domestic welfare	-0.04%	-0.04%	-0.02%	-0.08%
Effects, broken down:				
Prices				
Canada	0.01%	-0.03%	-0.23%	-0.24%
U.S. & Mexico	0.03%	-0.20%	-0.49%	-0.65%
South Korea	-1.90%	-0.17%	-0.02%	-2.09%
Japan	0.00%	0.42%	-1.03%	-0.69%
E.U.	0.11%	-0.44%	5.48%	5.24%
Mark-ups **(percentage point change)**				
Canada	-0.03%	-0.01%	0.03%	-0.01%
U.S. & Mexico	-0.02%	0.00%	0.07%	0.05%
South Korea	0.96%	0.00%	-0.01%	0.94%
Japan	-0.02%	0.17%	0.18%	0.34%
E.U.	-0.03%	0.02%	-0.09%	-0.11%
Quantities				
Production – Canada	-0.53%	-0.94%	-0.74%	-2.16%
Imports – U.S. & Mexico	-0.67%	-1.32%	-0.85%	-2.76%
Imports – South Korea	9.72%	-1.57%	-0.34%	7.68%
Imports – Japan	-0.88%	15.11%	-1.47%	12.34%
Imports – E.U.	-0.34%	-3.14%	28.32%	24.53%

The average price in the Canadian market is predicted to be 0.4% lower under an FTA with South Korea than the actual price observed in 2005. This is the combined effect of four influences. We will discuss each of these tendencies in detail for the FTA with Korea, but the same factors will operate in all other trade policy simulations. In the different policy scenarios discussed in the following sub-sections, the relative importance of each effect will vary substantially.

First, as a result of the import duty exemption, South Korean producers have a lower marginal cost which, ceteris paribus, lowers the market price. If their mark-ups would have been unchanged and if there were no response from competitors, all Korean prices would have been reduced by 5.75% (1-1/1.061). The model predicts the average Korean price to decline by only 1.9%, so more factors are at work. The pass-through to consumers of the tariff elimination was clearly less than 100%.

The second effect, which is directly within the Korean firms' control, is that, with the new marginal costs, optimal price-cost margins change. In particular, given that costs are lower, without changing mark-ups Korean vehicles would be priced at a lower point on the demand curve, where the elasticity of substitution is lower, and the optimal response would be to increase prices. The results indicate that the average mark-up did increase by 1%. We should point out that the size of this effect is likely to be overestimated because our functional form of demand imputes a very low demand elasticity for cheaper cars, a defining feature of many Korean vehicles. Furthermore, while the sole Korean firm is obviously most affected by this policy change—Hyundai imports 14 models that it assembles in Korea into Canada—GM's Daewoo subsidiary also exports 6 models to Canada, two of which are badged as Suzukis, one as a Pontiac and three as Chevrolets. Almost 1/3 of Korean imports in Canada are GM products.

Third, competitors will react to the Korean price cuts—the net effect of the lower marginal cost and the higher mark-up is to lower prices. The results indicate that the competitive responses of competitors are limited. Statistics in Table 2.7 indicate that the raw average price change of vehicles produced in Korea is -3.57%, while the price drop is several orders of magnitude smaller, between -0.01% and -0.03% for goods produced elsewhere. Note, once again that the price response of other producers will in turn lead to successively smaller price responses of Korean firms, etc. The statistics in Table 2.7 are the result of the eventual convergence of all these price responses, where no firm has any incentive to change its price anymore.

European producers have very little overlap with Koreans, most of their vehicles are in different segments, and they have the lowest price response. Several vehicles made in Canada, the first line in Table 2.7, are in segments where Korean vehicles are important, lower cars and lower SUVs and we find a larger response for Canadian-made vehicles. Disaggregating the price changes in Table 2.7 further (numbers not reported in the table) would reveal that Canadian-made vehicles in the small car segment see a 0.07% price drop, while those in the luxury car segment become only 0.02% cheaper. Similarly, averaged over all non-Korean producers, small SUVs become 0.05% cheaper while there is no noticeable price change in the upper SUV segment—where no Korean-made cars are sold.

Table 2.7 Average price change in response to trade policy change

Vehicles produced in:	**FTA with:** South Korea	**Japan**	**E.U.**	**Unilateral elimination of Canadian tariff**
Canada	-0.03%	-0.02%	-0.06%	-0.11%
U.S. & Mexico	-0.02%	-0.05%	-0.02%	-0.08%
South Korea	-3.57%	-0.08%	-0.02%	-3.67%
Japan	-0.02%	-4.44%	-0.07%	-4.54%
E.U.	-0.01%	-0.06%	-4.81%	-4.87%

Fourth, composition effects cannot be ignored. In Table 2.6, average price changes are minimal for all other regions, but looking at further digits reveals that they are positive. As the results in Table 2.7 clearly indicate, this does not imply that firms actually increase their prices—in fact the price of every single vehicle sold in Canada declines with the FTA. Rather, it implies that the composition of goods sold changes. Given that Korean products—which tend to be priced at the low end of the market—are even more competitive after the trade policy change, other producers lose sales there, which changes the weight on their average price towards more expensive vehicles.

Similarly, the 5.75% decrease in Korean marginal costs combined with the 1% increase in the mark-up does not translate into 4.75% lower prices because the composition of sales also changes for Korean firms. This is the result of two factors that lead to a higher relative weight on more expensive vehicles also for Korean producers. First, given that the demand elasticity is estimated to be increasing in price, a much greater fraction of the tariff savings are passed along to consumers of more expensive vehicles. It improves the competitive position of Korean vehicles much more in more expensive segments (middle cars and lower SUVs). Second, Korean firms are not as well represented in these upper segments, so their lower prices are less likely to lead them cannibalizing their own sales. In the lower SUV segment only 10% of the models are produced in Korea, as opposed to 30% of lower car models. Both factors lead to higher sales increases for more expensive Korean vehicles, which increases their average price.

Given this elaborate discussion, the rest of the results should be straightforward:

- Average prices fall slightly, which is mainly driven by an imperfect pass-through of the tariff reduction on Korean vehicles and to a lesser extent the result of competitive responses by other producers.
- Average mark-ups increase for Korean firms, mainly as a result of their lower marginal cost. Foreign firms lower their mark-ups slightly, both as a competitive response to the Koreans and as a compositional effect as their sales become more heavily weighted towards expensive vehicles.
- Aggregate vehicle sales increase, not surprisingly, as the average price of every vehicle sold in Canada declines. The pattern follows the mark-ups. The magnitude of the increase is lower than the price increase (even though virtually all ve-

hicles are priced on the elastic portion of demand), because mark-ups increase as well.

- Korean imports increase, while all other regions—including production in Canada—lose. We conjecture that the current demand system—with elasticities being uniformly increasing in price—underestimates the impact of the Korean output response. The Korean import response is sufficiently large that net Canadian imports increase for sure.
- Lower prices lead to a higher consumer surplus, but less profit is made on vehicles produced in Canada—providing opposite effects on aggregate welfare.
- Tariff revenue for the government is reduced by almost 22%.
- If we look at aggregate welfare in dollars terms, Table 2.5, we find that consumer surplus increases by $95m, made-in-Canada profits fall by $18m, and government revenue falls by $93m, for a net Canadian loss of $16m or a mere 0.4% of the welfare generated in this industry. Two caveats go with this finding. First, a demand system that estimates a higher demand elasticity for vehicles made in Korean—which seems plausible—would increase the benefits. Second, the loss in firm profits will to some extent accrue to the foreign owners of the Canadian plants (U.S. and Japanese corporations)—although part of the increase in variable profits might be captured by the workforce. This might lead one to discount the profit loss in Canadian welfare calculations.

2.4.3 FTA with Japan

The gist of the analysis associated with a Japanese FTA is similar to the analysis in the preceding sub-section. The demand elasticities in Table 2.8 preview the effects one can expect. Even if we limit attention to cars—the pattern on light trucks which are on average more expensive would be similar—Korean firms have a median demand elasticity significantly below the median for all other production regions, especially below Japanese or European imports. The last column of Table 2.8 contains these demand elasticities for all cars. As mentioned earlier this is a combination of the functional form of our demand system as well with a crowded product space in more expensive segments of the market.

Importantly, the large difference in the last column is for the most part a compositional effect. Within each market segment the differences between the regions are much smaller. Korean cars simply tend to be positioned predominantly in the small car segment, where demand elasticities are estimated to be low for all producers. This fact will work its way through the entire analysis.

One notable effect is that even though Japanese firms lower their prices on every single vehicle in every segment—90% of the Japanese price reductions range between 3.6% and 5.1%, indeed very close to complete pass-through—the composition effects are so strong that the average sales-weighted Japanese price ends up 0.42% higher under an FTA with Japan. This is largely the result of very expensive Lexus, Acura, and Infiniti products that see relatively large sales increases and pull up the average Japanese price. Given that these models are priced at the very elastic point of the demand curve, pass-through of the tariff savings is almost perfect, while at the same time consumers are estimated to be very price responsive.

Table 2.8 Median own-price demand elasticity for all car segments

	by car segment:			
Vehicles produced in:	**Small**	**Medium & large**	**Luxury**	**All cars**
Canada	-2.47	-3.74	-3.29	-3.44
U.S. & Mexico	-2.60	-3.94	-8.14	-4.01
South Korea	-2.05	-4.56		-2.52
Japan	-2.57	-4.48	-7.04	-5.00
E.U.	-3.04	-4.75	-9.46	-6.99

Mark-ups are estimated to change less than with the Korean FTA, which is the result of a much smaller share of Japanese vehicles in the lowest price segments. The best-selling Toyota, Honda, and Nissan small cars are all produced in North America. Given that mark-ups are estimated to be lower in the more expensive segments, we find less of a response by Japanese firms as well as by competitors. Notably, the largest effect is for European producers which compete with Japan-made cars in all luxury segments.

Because the estimated pass-through of the tariff savings is higher than in the Korean FTA case and because the estimated demand elasticity for Japanese products is higher on average, the estimated import increase of Japanese cars and light trucks is higher, at 15.1%. This increase works its way into higher total imports in Canada, 1.04% higher, and lower domestic production, a change of -0.94%.

While the average price drop is lower under an FTA with Japan than with Korea, -0.27% versus -0.35%, to a large extent this is caused by consumers trading up and purchasing more expensive Japanese imports. The increase in consumer surplus is twice as high as in the previous analysis, +0.60% versus +0.28%.

While 2005 imports of Japanese vehicles were only 32% higher than Korean imports, the average value of these vehicles was much higher. As a result, the cost of the FTA in lost tariff revenue for the Canadian government is estimated to be more than twice as high as in the previous sub-section, -44.8% versus -21.8%. As a result of this final factor, and in spite of the robust consumer gains with a Japanese FTA, overall Canadian welfare is estimated to be lowered by exactly the same amount as in the preceding analysis, -0.04% or $15m. However, the distribution of that amount is noticeably different. Consumers would gain $203m, more than twice as much, while the bulk of the loss would fall on the government. Of course, indirectly this burden falls on the taxpayers, approximately 80% of which bought the outside good (i.e. not a new car) in 2005.

2.4.4 FTA with the E.U.

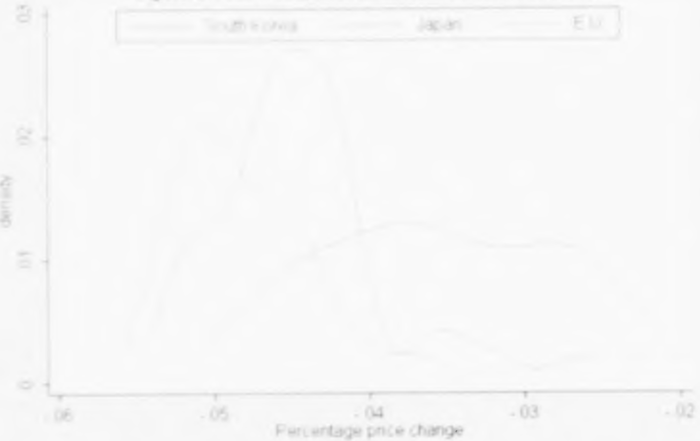
Finally, the higher demand elasticity of the median European car in every segment, see Table 2.8, leads to qualitatively similar results as in the Japanese FTA case, but with even stronger compositional effects. For example, the average price is predicted to increase, as the extremely expensive European vehicles gain market share. The same compositional effects, lead to a lower weighted-average European mark-up, as percentage mark-ups are estimated to be lower for more expensive vehicles. The intermediately-priced Japanese producers, on the other hand, see sales of their most expensive vehicles decline, which raises their average mark-up.

The price responses are rather impressive. The average Canadian price is estimated to increase by almost a full percentage point, even though the average mark-up goes down. Consumers trade up to more expensive vehicles very aggressively, which leads to an increase in consumer surplus almost as large as under the Japanese FTA—even though European imports numbered less than half of Japanese imports in 2005. This surge in expensive car purchases also boosts firm profits, which on average rise by 0.40%, although lower domestic production hurts Canadian producers. As before, the loss of tariff revenue on the expensive European imports is estimated to set Canadian tariff revenues back a full 36.6%, a revenue loss almost twice as high as under the Korean FTA even though Korean imports, in units, were almost double European imports in 2005. When all is said and done aggregate welfare hardly budges, falling by $6m or about 20c per Canadian.

We do not discuss these results at length because they depend crucially on the high demand elasticity for expensive vehicles. 30 of the 38 European imports are in the luxury car or large and luxury SUV segments. Even the three European entries in the small car segment are among the 10 most expensive vehicles in that segment. While only 17% of models sold in Canada are assembled in Europe, 56% of the luxury car segment entries are.

Moreover, the 38 European imports are sold by 6 different firms while the 20 Korean imports are sold by only 2 firms. As a result, in the case of a European FTA, multi-product considerations are not holding firms back from lowering their prices.

Figure 2.1 Price responses in the three FTA scenarios



The effects of this very different market presence and ownership structure for firms from the different regions shows up directly in the price adjustments to the different FTAs. The lines in Figure 2.1 plot a smoothed histogram for the distribution of percentage price changes under the three different scenarios only for the models that gain a direct advantage of the policy change, i.e. the price changes for Korean-made vehicles are plotted only in the case of the Korean FTA, and similarly for the other two regions. The green line represents the distribution of price responses for European-made cars under an FTA between Canada and the E.U. Clearly price changes are concentrated around -5.1%, very close to the 5.75% that would indicate complete pass-through of tariff changes. In contrast, the red line for vehicles made in Japan shows many more intermediate price changes, around -4.3%, while the blue line for Korea indicates that for many of those models price reductions are less than half of the tariff reduction.

While the extent of substitution between imports and domestic production and between the imports of the different countries is likely to be robust to the other specifications of the demand system, this difference in average price responsiveness by region hinges crucially on the average difference in demand elasticity. It is not impossible that consumers purchasing the expensive vehicles are indeed as price sensitive as the demand model predicts, but to increase confidence in the results, we would like to see how high the α coefficient on price would be estimated when price changes over time are used to identify the coefficient, rather than an identification solely from the cross-section of vehicles as is currently the case. Also, a more general demand model should ideally either incorporate a random parameter on the price or different nesting parameters by segment. Unfortunately, incorporating these changes would require much more data and take a lot of time.

2.4.5 *Unilateral elimination of the Canadian import tariff*

Finally, a unilateral elimination of the import tariff by Canada, results are in the final columns of Tables 2.5 and 2.6, is predicted to lead to the largest drop in aggregate welfare of the four trade policy experiments. One might be surprised by this finding, as the common economic wisdom predicts that free trade is good for welfare, or not? One should not forget that this is a concentrated industry with differentiated goods and firms are expected to have a lot of market power. Moreover, distributional effects between consumers, domestic and foreign profits, and the government are crucial.

In particular, consumers are estimated to gain the equivalent of $464m in consumer surplus, while Canadian producers are expected to lose $67m on their domestically produced vehicles—relative to the 2005 baseline. However, these same firms are also importing a lot of vehicles, and on average the worldwide firm profits are predicted to increase by $97m.

The results in Table 2.9 break the aggregate profits down by firm. Firms that rely more on imports are likely to gain most. Most prominent are Hyundai, BMW, Nissan, and Ford. Note, however, that the new Hyundai plant in Alabama will lower the expected benefits that Hyundai can hope to achieve from tariff elimination. Only firms that produce a large fraction of their Canadian sales domestically, especially GM and to a smaller extent also Honda and DaimlerChrysler, stand to lose from the Canadian elimination of the import tariff.

Table 2.9 Change in profits without the Canadian import duty (by firm)

Corporate group	2005 profit	Change in profit without import duty	
	(million $)	(million $)	(%)
GM	$3,601	-$60	-1.67%
Ford	$2,136	$22	1.04%
DaimlerChrysler	$1,625	-$4	-0.25%
Toyota	$1,150	$15	1.33%
Honda	$962	-$11	-1.10%
Hyundai	$585	$53	9.00%
Nissan	$456	$24	5.35%
Volkswagen	$219	$13	6.17%
BMW	$140	$25	18.04%
Subaru	$93	$8	8.92%
Mitsubishi	$58	$3	4.90%
Porsche	$12	$8	64.23%
Total	$11,034	$97	0.88%

Note: The corporate groups include partially owned subsidiaries: GM includes Suzuki and Ford includes Mazda

So while consumers would gain from such a trade policy and most of the firms would as well, the Canadian government would lose $426m in tariff revenue, or approximately $24 per labor market participant, which is not negligible. On the other hand, the higher price for the average vehicle combined with higher demand would increase sales tax. Additional GST revenues would run to $42m for the federal government and a similar amount for the provinces. These numbers are not included in the welfare calculations because a gain for the government would be a loss to consumers.

At the same time Canadian production is estimated to decline by 8,668 units annually. While this is not nearly enough to noticeably impact assembly plant capacity decisions, no doubt some jobs would be lost—including employment in supplier plants—and some workers would face transition costs. On the production side, it is notable that the U.S. and Mexico would be slightly harder hit than Canada in percentage terms, but in total units of production the sales decline south of the border would total 21,777 units. Given the compositional effects discussed earlier, it is no surprise to find that although all three importing regions benefit, the import gains go disproportionately to the E.U., which sees its imports increase by almost 25% versus only 7.7% for Korea.

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3. Impact on FDI in assembly plants

This section assesses the potential impact of eliminating MFN tariffs discussed in section two above for new vehicles on the location decisions of auto assembly in North America, particularly in Canada. What will be the impact of Canada's bilateral or regional FTAs, those already in existence and those under negotiation (such as Canada-Korea) on other trading partners' location decisions in Canada?

A tariff on final vehicle imports provides incentives for foreign firms to establish local production capacity to avoid the tariff, so-called tariff-jumping. While at the margin the effect certainly exists, current tariff levels are sufficiently low and the overcapacity in the industry sufficiently large that we do not expect much of an impact. The expected cost of the elimination of the tariff on final vehicle imports is the product of the following four factors:

(1) Probability that a foreign firm will decide to build a new assembly plant in North America in the near future.
(2) If such an investment would take place, the probability that the elimination of the Canadian tariff would stifle the project.
(3) If such an investment would have taken place, the probability that a site in Canada would have been chosen over one in the U.S. or Mexico.
(4) Net benefit of an assembly plant to Canada.

Each of these four factors will be discussed separately in subsections 3.1–3.4. We will argue that (1) few new capacity additions in North America can be expected in the next decade; (2) the impact of Canadian trade policy on such FDI decisions is likely to be minor; (3) the likelihood of any future investment in North America assembly capacity going to Canada is lower than in more central locations; (4) a significant fraction of the value to the Canadian economy will be "lost" to the firm making the investment in the form of a subsidy to attract the FDI in the first place.

Moreover, if a change in Canadian trade policy is matched by a similar tariff concession abroad, the effect would also work in reverse, as discussed in Section 3.5. Tariff-jumping FDI abroad would stop, potentially increasing investment in new or existing North American plants.

3.1 New capacity additions in North America

The probability that a firm will expand assembly capacity in North America beyond the currently announced expansion plans is fairly small. Table 3.1 indicates the number of assembly plants in operation over the last thirty years. Even though the production level in North America was higher in 2004 than in 1985 (see Figure 1.1A), the number of assembly plants has remained more or less constant. Canada and the North-East of the United States have seen a loss in plants, and more closures have been announced. Mexico and the U.S. South-West, on the other hand, have seen more plants open than close over the last decade; these areas have been particularly popular with transplants—foreign producers.

Table 3.1: North American assembly plants (1975-2004)

	1975	1985	1995	2004	announced
Total plants	68	85	88	84	
By country					
Canada	10	12	14	10	+1, -1
USA North/East	35	46	43	41	-3
USA South/West	18	18	18	22	+2, -1
Mexico	5	9	13	11	1
By ownership					
American[1]	66	79	70	65	-5
Asian	1	4	14	16	4
European	1	2	4	3	

Notes: 1 Includes plants now owned by DaimlerChrysler; Ford will announce assembly plant closures in January 2006, the expectation is 3-4

Source: Ward's Automotive Yearbook (various years) and Ward's Infobank (2004)

A net decrease in capacity in the coming years is expected as GM and Ford are likely to close more plants than the European or Asian producers will open. In terms of FDI for Canada, it does matter where the transplants will put their new plants. For foreign producers that operate only a few plants on the continent, it is often advantageous to locate them close by one another so they can share suppliers more easily. Moreover, now that most cars and light trucks are produced in smaller model runs in a single plant and shipped across the continent, economizing shipping costs makes the centre of the continent relatively more attractive than Canada[32].

Table 3.2 lists each foreign firm currently selling vehicles in North America with their production and sales statistics for 2002. Firms are ordered by total sales; it is also indicated what fraction is satisfied by domestic production, and how many vehicles are imported.

Toyota has just completed construction of a compact pickup plant in Baja California, Mexico and will start production at its full-size pickup plant in Texas in 2006. It has announced a new plant for compact SUVs in Woodstock, Ontario. Production of each of these plants is not factored into Table 3.2 yet and they will add at least 400,000 vehicles to Toyota's North American production capacity. Given the high growth rate of Toyota's North American sales—it consistently averages almost 10% in Canada and the U.S. and it only recently entered the Mexican market—a new plant is certainly on the horizon.

Honda has also seen large sales increases, but in 2002 it only imported 334,000 vehicles. While this is certainly enough to fill an assembly plant, this total comprises a wide range of models that even with Honda's flexibility would be hard to produce in one plant. Honda now produces more vehicles in North America

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[32] The changing geography of the industry in North America is a topic I cannot possibly do justice here. I refer the interested reader to recent work by Thomas Klier, senior economist at the Federal Reserve Bank in Chicago. His most recent analysis on the subject have appeared in the bank's *Economic Perspectives* series, third quarter of 2005. *Chicago Fed Letters* in February 2005 and March 2006 have featured articles on the transition of the auto supplier industry with a particular focus on the role of the Midwest. On the other hand, the analysis in the presentation that Sean McAlinden of the Center for Automotive Research gave at the April 2006 conference on "The New Geography of Auto Production" organized by the Chicago Fed in Detroit was much more critical of the North-South shift (the presentation is online at the web site of the Chicago Fed).

than in Japan. Its North American sales have increased a lot in the last three years as it entered many new segments, especially in light trucks. In the past, Honda added a second assembly line to an existing site (Marysville, OH and Alliston, Ontario) to increase capacity. Especially its latest plant in Lincoln and its Mexican plant are still a lot smaller than their other operations and could be expanded before Honda ventures to a new site.

Table 3.2: North American production and sales of foreign firms

	Production		**Sales**	
		total	**domestic**	**imported**
Toyota[1]	1,196,019	1,912,729	1,110,753	801,976
Honda	1,138,717	1,443,595	1,109,618	333,977
Nissan[2]	750,925	1,016,167	714,512	301,655
Volkswagen	332,876	662,585	297,211	365,374
Hyundai		442,036		442,036
Mitsubishi[1]	174,466	349,200	170,268	178,932
Mazda[1]	47,603	329,353	120,151	209,202
BMW	124,374	280,295	58,662	221,633
Kia		266,359		266,359
Subaru-Isuzu[1]	131,833	255,438	137,912	117,526
Mercedes-Benz	102,983	231,315	43,337	187,978
Suzuki[1]	12,609	79,413	8,380	71,033
Daewoo		38,254		38,254
Porsche		22,793		22,793
Renault		15,386	11,185	4,201
Peugeot		9,148		9,148

Notes:

1 Production includes the shares in joint ventures: NUMMI (Toyota), AutoAlliance (Mazda), CAMI (Suzuki), Subaru-Isuzu, Diamond-Star (Mitsubishi). Includes Toyota production at NUMMI;

2 Nissan production includes its output for Renault in Mexico

The third largest transplant producer, Nissan, operates a huge plant in Smyrna, TN and two large Mexican plants. In 2002 it imported 302,000 vehicles and it is growing strongly recently. Given the closer integration with Renault, there are always rumours that the French automaker might consider a comeback to the U.S., but that is highly speculative.

After a number of lean years, Mazda is working its Auto-Alliance joint venture with Ford flat out, producing more than

260,000 vehicles at full capacity. The majority of these, however, are Ford Mustangs. Even with a string of very well received models, in 2004 the Mazda 3 became Canada's best selling passenger car, its total North America sales have not increased beyond its 2002 level. Given that Ford, which owns a controlling stake in Mazda has a lot of spare assembly capacity, greenfield investments by Mazda are not on the horizon.

Mitsubishi, Subaru, Isuzu, and Suzuki are in not in great shape and surviving is the first priority for these firms now. The proliferation of vehicles, discussed in Section 1.3, greatly increases the development burden for these smaller firms. Mitsubishi was associated with DaimlerChrysler and they were developing a compact car together, but that link has been severed. Subaru was partly owned by GM, but that stake was taken over by Toyota. It will take a long time to integrate production of Subaru's in Toyota plants, should Toyota choose to do so. Isuzu and Suzuki are still partly owned by GM, but their total sales would barely dent the surplus capacity at GM.

Summing up for the Japanese producers, Toyota is likely to increase its North American assembly capacity by at least one plant in the next decade. Honda and Nissan might consider investing as well, but their plant has to be either relatively small or extremely flexible, because their imports are a varied bunch. The recent decrease in the yen, the possibility to expand existing North American factories (outside Canada), and Honda's overcapacity in Japan, makes a new plant unlikely to happen soon.

The next investor in North American assembly plants will be Hyundai, which recently opened a plant in Alabama. Early 2006 it decided on a site in Georgia for its Kia subsidiary, nearby its Hyundai plant in Montgomery, AL so it can share suppliers for its two plants. Further capacity expansions are highly uncertain; the viability of the Kia plant already relies on a very ambitious sales projection and the Alabama plant will take some time to ramp up its production to its full capacity of 300,000 vehicles per year.

Finally, in 2003-04 the European producers were also considering North American assembly plants when the euro was breaking records on the currency markets on a daily basis. More recently, North American production capacity is not the highest priority for most manufacturers. Volkswagen, the largest European importer, has seen sales of its main brand slump and faces high restructuring costs and overcapacity in Europe. An Audi plant is not entirely impossible, but at sales below 100,000 it is unlikely. Mercedes-Benz does not produce any sedans in North America and quality control problems makes this an unlikely proposition for the near future. BMW produces less than 10,000 cars in Mexico and around 25,000 roadsters in Spartanburg. The majority of its sedans and even its new compact SUV are imported. Given that it is unlikely that the Mini, the 3 series and its larger cars can be produced efficiently together in one plant, a new BMW plant in North America is also highly unlikely.

In sum, for the coming 10 years that leaves one plant for Toyota, probably one plant for Honda, and maybe one for Nissan to substitute domestic production for imports[33].

3.2 Sensitivity of investment in vehicle assembly to Canadian tariffs

If an assembly plant satisfies domestic content requirements under NAFTA, it qualifies for duty-free exports to other NAFTA member states. In this case, the effect of the elimination of the Canadian import tariff on a firm's likelihood to go ahead with the project is independent of the actual location of the plant—discussed in the next Section[34].

If a firm were contemplating constructing a new plant anywhere in North America (or add capacity to an existing plant), we have to consider how the probability of an investment would be affected by a Canadian tariff cut. Given that production of virtually all North American plants is sold over the entire continent, Canadian sales will be proportional to Canada's size in the North American market. In 2002 this share was 8.7% and declining over time. Value weighted its share will be even lower as the average price of vehicles sold in the much larger U.S. market is higher and the lower average price in Mexico applies to only approximately half as many vehicles as sold in Canada.

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[33] At the time this document was last revised, both Honda and Kia had confirmed that they will build their next assembly plant in the U.S. Toyota's announcement to built a second assembly plant in Ontario almost guarantees no further assembly investments of the company in Canada in the near future. That leaves only Nissan as a possible new investor and according to news reports, the Ontario government has already started talks with the company (The Canadian Press, May 17, 2006).

[34] If a plant is located in Canada or Mexico, satisfying the domestic content requirements is imperative for a plant's viability because of the size of the U.S. market.

For trade policy, the scenario we are interested in is a foreign producer that in the presence of the Canadian tariff of 6.1% would decide to build a North American plant, but in absence of the tariff would cancel the investment. For a typical greenfield investment of 150,000 vehicles that would mean on average 13,050 vehicles heading towards Canada. At a ballpark out-the-factory-door cost of $20,000, the elimination of the Canadian tariff would tilt the balance of costs and benefits of the new plant by less than $16m against investing in North America.

One can think of a lot of other idiosyncratic changes that would have an equal, even larger, effect. Note that the annual output of the hypothetical plant is estimated to be worth $3b and that each 1% change in the value of the foreign currency would have more than double the effect of the Canadian trade policy. To put this in perspective, over the last year the dollar has appreciated 15% against the yen and 12.5% against the euro. These trends are approximately 30 times as important as any change in Canadian trade policy. Any increase in shipping costs per vehicle by $105, which is likely to be less than the impact of the recent doubling in fuel prices, would have an equal effect in favour of locating in North America. A change in labour costs at the assembly plant of only 3.5% would also have a comparable effect.

In sum, we believe that the share of any North American production heading for the Canadian market is too small for the Canadian tariff of 6.1% to have much of an impact. Throughout, we have assumed that the U.S. tariff levels, at 2.5% for cars and 4% for light trucks, remain constant. Given the much larger importance of the U.S. market, the elimination of U.S. tariffs on final vehicle imports would have an impact on foreign firms' location decisions that is more than five times larger.

3.3 New capacity additions: Canada versus the U.S. or Mexico

Even if a firm would change its investment plans in response to a Canadian tariff cut, it would only constitute a loss of FDI for Canada if the plant would have been constructed there otherwise. As long as firms produce vehicles that satisfy the NAFTA domestic content requirements, currently 62.5%, the location within the NAFTA area is independent of the individual countries' tariff levels. Even though import tariffs on final vehicles in the U.S. are lower than in Canada and much lower than in Mexico, this does not make the U.S. a more attractive location because all local production can be traded within the area duty free.

Assuming a firm wants to establish a new assembly plant in North America (analyzed in Section 3.1) and assuming that this investment would be cancelled if Canada eliminated its import tariff (analyzed in Section 3.2), we now investigate what the probability is that Canada would have been chosen for a new assembly plant site. The Canadian track record in attracting FDI is readily available. Table 3.3 lists the ten most recently constructed or announced light vehicle assembly plants in North America. Only one of those plants will be built in Canada. The Northern U.S., the traditional hotbed of the industry only received two plants (one of which was very small). Clearly, the most popular region has been the Southern U.S. and to a lesser extent Mexico.

Three factors are important for future North American plants. There are clear network effects in organizing one's supply chain. If two assembly plants are located reasonably close, they can use the same supplier even for parts which are just-in-sequence, i.e., for which suppliers cannot be farther than a 2–4 hours drive. This makes it likely that the new Kia plant, which is supposed to be the next North American plant, will be constructed close to the Hyundai plant in Montgomery, AL. Such co-location decisions by foreign producers make it also more likely that their preferred suppliers from their home country will join them in North America.

Table 3.3: Location of the most recent light vehicle assembly plants in North America

Plant name	Owner	Start-up	Product
Canada			
Woodstock, ON	Toyota	2007	Compact SUVs
Northern United States			
Mishawaka, IA	GM (AM Gen.)	2001	SUVs
Lansing Gr. Rapids, MI	GM	2001	Cars and light trucks
Southern United States			
Lincoln, AL	Honda	2001	Light trucks
Canton, MS	Nissan	2003	Full size pickups
Montgomery, AL	Hyundai	2005	Cars and SUVs
San Antonio, TX	Toyota	2006	Full size pickups
Mexico			
Toluca	BMW	1999	Cars
Toluca North	DaimlerChrysler	2001	Light trucks
Baja California	Toyota	2005	Compact pickups

Source: Ward's Automotive Yearbook (various years); Automotive News (various issues)

Of course, given that both Toyota and Honda already own plants in Canada, this could work to Canada's advantage. In the case of Toyota, the ability to share suppliers with its well-established Cambridge operation was crucial in the selection of Woodstock, Ontario for its seventh North American plant. It is not implausible that Honda will also look at Ontario sites should it decide to build a new plant in North America. Furthermore, given that a lot of FDI takes the form of expanding an existing facility, the presence of two Toyota, one Honda, and one Suzuki-GM plant in Ontario also opens the door to further capacity increases in Canada. Table 3.4 contains all active, announced, and recently closed Canadian assembly plants.

Table 3.4: Canadian final assembly plants (light vehicles)

Plant name	Owner	Capacity	Start-up	Closed
Active:				
Alliston 1	Honda	390,000	1986	
Alliston 2	Honda		1998	
Cambridge North	Toyota	270,000	1988	
Cambridge South	Toyota		1998	
Ingersoll	CAMI (GM-Suzuki)	100,000	1989	
Oshawa Truck	GM	275,000	1964 (?)	
Oshawa #1	GM	545,000	1954 (?)	-1/3 in 2006
Oshawa #2	GM		1954 (?)	2007
Oakville	Ford	290,000	1953	
St. Thomas	Ford	230,000	1967	
Bramalea, (Brampton)	DaimlerChrysler	240,000	1986	
Windsor	DaimlerChrysler	350,000	1928	
Announced:				
Woodstock	Toyota	100,000	2008	
Closed:				
Ste. Therese, QU	GM		1965	2002
Ontario Truck (Oakville)	Ford		1965	2004
Pilette Road (Windsor)	DaimlerChrysler		1975	2003
Halifax, NS	Volvo		1963	1998
Bromont, QU	Hyundai		1989	1993

Notes: Unless otherwise indicated, all plants are in Ontario, this comprises all remaining plants.

A second factor, already mentioned before, is the desire to minimize shipping costs for vehicles, which tend to be much greater than for parts. As long as the most popular vehicles had annual sales greater than the minimum efficient scale of a single assembly plants, several plants around the continent were set up to satisfy demand. Currently, this is only the case anymore for a few full-size pickup trucks. Most other vehicles are assembled in a single North American plant. This makes a central location on the continent more attractive, and works to Canada's disadvantage.

The third factor that plays a large role in the selection of an assembly site is government subsidies. There is a large literature on location incentive tournaments that pit multinational enterprises against the governments in whose jurisdictions they consider investing. It is uncertain to what extent the subsidies influence the investment decision, but they certainly have an impact on the location if the FDI goes ahead. The decision of Ford to completely overhaul its minivan plant in Oakville, which has been operating below capacity for a while, and Toyota's decision to locate its latest plant in Ontario were facilitated by the Ontario and federal governments' recent subsidy initiatives. In April of 2004, the provincial government made $500m in funds available under the Ontario Automotive Investment Strategy, to cover 10% of investment costs of projects exceeding $300m. The federal government launched the Canadian Skills and Innovations Project in June, 2004 and pledged $1b for Canadian manufacturing, half to match the Ontario initiative. While this indicates that the different Canadian jurisdictions are willing to enter the subsidy game to attract investment—making investments in Canada more likely—it also lowers the (remaining) value of an assembly plant to the economy, as the investing firm is able to extract some of the surplus.

Finally, it should be mentioned that a plant located in the U.S. could choose not to satisfy the NAFTA domestic content requirements and simply pay import duties on the (small) fraction of production that is exported to Canada. For example, the BMW plant in Spartanburg, NC and the Mercedes-Benz plant in Vance, AL are estimated to have only 35% domestic content, well below the 62.5% required for duty-free access to Canada. Given that the models built in these plants are less appealing to the Canadian or Mexican market, luxury SUVs and a roadster, the companies simply pay the import duties. In this case, the elimination of the Canadian tariff would not lead to lost FDI for Canada, but it would cost Canada tariff revenues.

3.4 Net benefit of a new vehicle assembly plant to the Canadian economy

Finally, in the unlikely case that a firm decides to cancel a Canadian investment project because the Canadian tariff was cut, we discuss the loss to the Canadian economy of this lost FDI. This is a hotly debated topic and estimates range widely. The most recent paper on the topic, by Michael Greenstone and Enrico Moretti, estimates the spillover effect of such an investment on the regional economy from increases in local property values in the selected location relative to the trend in extremely similar runner-up location(s). They find a significant and positive effect using a sample of investment projects in a variety of manufacturing sectors.

The automobile industry is in some respects different from most industries. (i) With certainty additional employment will be generated in supplier plants that locate nearby, although the multiplier has been declining over time. (ii) Wage rates in the industry are substantially above manufacturing wages in similar locations and the difference seems too large to be explained entirely by human capital differences. The traditional explanation is that the well-organized unions have been able to extract some of the rents in this oligopolistic industry. (iii) The automobile industry is becoming increasingly high-tech. The R&D expenditure per capita in Michigan is the highest of any state in the United States and 85% of it is in automotive technology. Unlike many other sectors, the vast majority of research is privately funded. This research intensity can create technology spillovers to nearby firms and human capital spillovers in the workforce as workers receive continuous training.

While these factors would increase the beneficial effect for the local economy of attracting automotive investments, they have also encouraged governments to offer subsidies to attract these plants in the first place. While the size of the externalities associated with automotive FDI can be debated, they are certainly positive. However, the spillover effects would be positive for several jurisdictions. As a result, the competing jurisdictions will engage in a bidding war to attract the plant[35]. The winning jurisdiction does not have to give away the entire surplus, just enough to make the firm indifferent between itself and the next best alternative. The losing jurisdiction, however, should have offered the entire surplus it expected from the investment. As a result, the net gain to the Canadian economy of a successfully attracted FDI program is expected to be equal to the intrinsic value a Canadian location can bring to the firm.

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[35] Maureen Molot-Appel (2005) discusses the subsidy games of the last two FDI waves in the automobile industry.

Figure 2.1: An illustration of the optimal subsidy offer

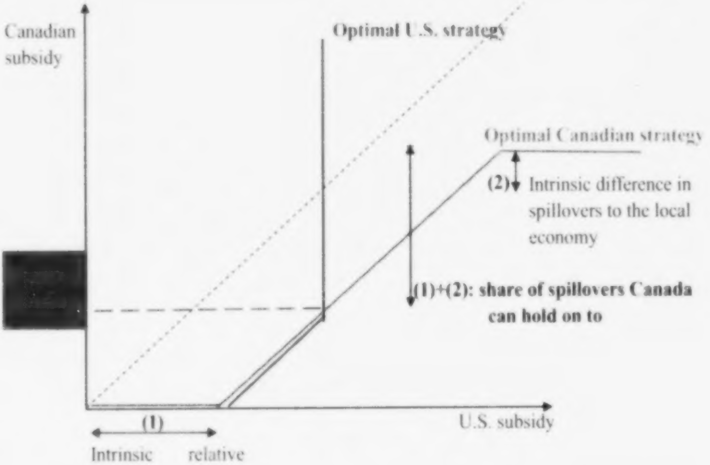
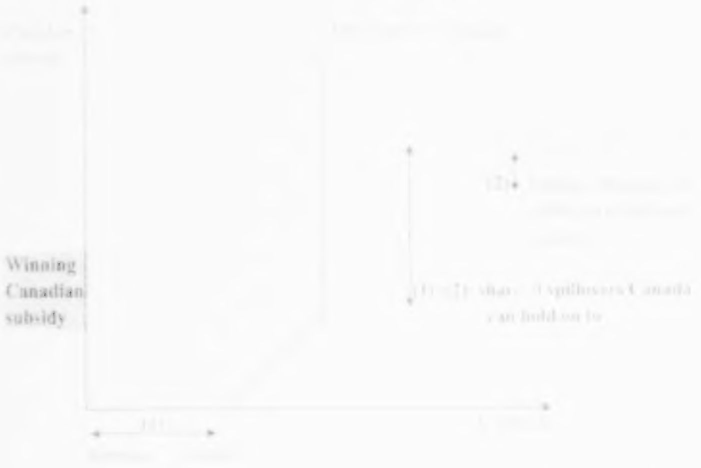

Canadian subsidy
Optimal U.S. strategy
Optimal Canadian strategy
(2)
Intrinsic difference in spillovers to the local economy
(1)+(2): share of spillovers Canada can hold on to
(1)
Intrinsic relative
U.S. subsidy

Figure 2.1 gives a graphical example of the equilibrium of such a subsidy game. In the hypothetical example depicted, a Canadian and U.S. jurisdiction compete to attract a new assembly plant by offering subsidies. Two magnitudes are important. (1) Indicates the intrinsic relative advantage of the Canadian site. As depicted, absent subsidies the firm would choose to locate in Canada. As long as the U.S. jurisdiction offers subsidies smaller than (1), where the blue line slopes upwards, Canada would be the preferred location. (2) Indicates the relative difference in spillovers to the local economy. In the example, this quantity would be greater for Canada, perhaps because of greater unemployment in the selected location, or more potential sites for suppliers to locate nearby. The maximum subsidy the Canadian jurisdiction will offer is equal to the total spillover it expects, indicated by the horizontal red line, and similarly the best alternative. The losing jurisdiction, however, should have offered the entire surplus it expected from the investment. As a result, the net gain to the Canadian economy of a successfully attracted FDI program is expected to be equal to the intrinsic value a Canadian location can bring to the firm.

Figure 2.1: An illustration of the optimal subsidy offer



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maximum U.S. subsidy are its expected spillovers, the vertical blue line. Given that the blue U.S. line intersects the 45 degree line below the red Canadian line, we know that expected spillovers are larger for Canada, at least in this example.

The optimal subsidy offers are straightforward to derive. They are similar to the Bertrand Nash optimal price strategies discussed in most industrial organization books. The intersection gives the winning subsidy for Canada, $1 above the expected U.S. spillovers. Relative to the expected Canadian spillover, the winning jurisdiction is able to hold on to the magnitudes (1) and (2), its relative advantage for the firm and for itself over the next best alternative. Note that if the expected spillover would be larger in the U.S. jurisdiction, the relative size of (1) and (2) would determine the plant location and the winning jurisdiction would have to offer most of its advantage to the firm as a subsidy in order to attract the FDI.

The crucial insight to take away from this example is that even though the value to the local economy of automotive FDI might be very large, a significant fraction will accrue to the firm making the investment in the form of a subsidy to fend off competition from other jurisdictions.

3.5 Higher investment in Canada

Just as there is an ever so slight loss in FDI (in expectation) from the elimination of the Canadian imports, the same analysis can be applied in reverse if trading partners eliminate their tariffs. The expected benefit in this instance is the product of the same four factors considered above. Two differences are especially notable: foreign tariffs tend to be much larger, leading to a larger expected effect, but comparative advantage might disadvantage Canada in the relatively labour-intensive assembly stage of production, lowering the expected effect.

Exports of finished vehicles from North American are limited. Statistics in Table 3.5 are an attempt to construct export volumes for the major North American producers. While export statistics are not collected directly, we can obtain an estimate by subtracting sales of domestically produced vehicles from production. The result is the sum of exports and inventory accumulation. Only one firm, Ford, is a significant exporter. This pattern is unlikely to change in the future; no one expects North America to become an export base for finished vehicles.

Table 3.5: Exports of light vehicles from North America (2002)

	Passenger cars		Light trucks		Total light vehicles	
	Production	Exports[1]	Production	Exports[1]	Production	Exports[1]
General Motors	2,458,052	54,284	3,159,053	104,438	5,617,105	158,722
Ford	1,437,905	442,105	2,690,958	366,641	4,128,863	808,746
Chrysler Group	649,673	20,983	2,042,153	130,826	2,691,826	151,809
Toyota	750,621	58,093	445,398	27,173	1,196,019	85,266
Honda	835,335	14,114	303,382	14,985	1,138,717	29,099
Nissan	544,026	40,997	206,899	-4,584	750,925	36,413
BMW	24,234	12,349	100,140	53,363	124,374	65,712
Mercedes-Benz			102,983	59,646	102,983	59,646
Volkswagen	332,876	35,665			332,876	35,665

1 Exports include changes in inventories from one year to the next.

Source: Own calculations based on Ward's Automotive Yearbook (2003)

The reverse effect of the preceding analysis would predict that lower tariffs in other countries would reduce the necessity for firms to set up plants overseas and instead satisfy foreign demand by exporting Canadian production. As in the previous section, it would be implausible to expect large effects. The modern flexible production systems are designed to sacrifice some scale economies, but increase the ability to produce a greater variety of vehicles on the same assembly line. This helps firms to offer a wider selection of vehicles in mature markets. At the same time, it also facilitates firms to produce vehicles closer to the final consumer. Rather than having each plant dedicated to a single vehicle, even assembly in smaller (overseas) markets becomes viable if a large fraction of the lineup that is sold in that country can be assembled in a single local plant.

The recent record confirms that the emerging demand for vehicles in Asia and Latin America is being met by adding local production capacity. The European market is increasingly being served from plants in Eastern Europe, where wages are substantially lower. Earlier statistics also illustrated the growing importance of Mexico as a North American producer. While exports of finished vehicles from low-wage countries are only a marginal phenomenon for the moment, this might reverse in the near future. The labour cost in final assembly is too small to make up for the high transport cost of finished vehicles. Once the emerging producers develop their own supply chain and are able to produce a greater fraction of a vehicle's content domestically at lower wages, vehicle exports might take off. Hence, large export volumes of vehicles from Canada to the rest of the world seems an unlikely proposition.

4. Market analysis: aftermarket components

This section estimates the potential impact of eliminating MFN tariffs on aftermarket auto parts on the production, employment, consumption, and trade of aftermarket auto parts in Canada; documents and analyzes the industrial trends in the auto parts sector; and assesses Canada's position and advantages.

4.1 Aftermarket parts

To put in perspective what part of the automobile industry we will discuss in this section, Table 4.1 contains total employment statistics for all the different automotive sub-sectors.

In total, the industry is estimated to have employed 892,700 workers in 2004, an increase of 6.8% over the 2000 total. Total employment breaks down into 45.8% in the aftermarket sector, 26.8% in manufacturing (parts and final assembly combined), 18% in vehicle sales, and a final 9.3% in other automotive related sectors, such as road construction or rentals[36]. The breakdown has been relatively stable over the last five years, although manufacturing continues its decline, mirroring the trend in the aggregate economy. The service side of the industry has clearly becomes the most important employer—the sum of employment in aftermarket and sales stood at 63.8% of the automotive workforce. Given that these services are largely non-tradable, the importance of trade policy has declined over time. In terms of total sales or value added, however, the contribution of manufacturing will be much higher than its employment share.

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[36] Note that these statistics draw on Statistics Canada Labour Force Surveys and the totals are markedly different (higher) from the totals obtained aggregating employment statistics from the Annual Survey of Manufacturing. The relative importance of the different sub-sectors, however, is relatively similar using either source.

Table 4.1 Total employment in different sub-sectors of the automobile industry

	NAICS	2000	2004	Change 2004-2001
Aftermarket				
Motor Vehicles, Parts & Accessory wholesale	4152	23.3	29.1	24.9%
Automotive Parts & Accessories stores	4413	35.1	31.3	-10.8%
Gasoline Service Stations	4471	81.3	79.4	-2.3%
Other General Merchandise Stores	4529	98.8	120.1	21.6%
Automotive Repair & Maintenance	8111	140.1	149.2	6.5%
Total		**378.6**	**409.1**	**8.1%**
% of Automotive Employment		**45.3%**	**45.8%**	
Vehicle Assembly & Parts Manufacturing				
Motor Vehicle Manufacturing	3361	81.5	80.9	-0.7%
Motor Vehicle Body & Trailer Manufacturing	3362	20.1	18.4	-8.5%
Motor Vehicle Parts & Accessories mfg	3363	133.8	140.2	4.8%
Total		**235.4**	**239.5**	**1.7%**
% of Automotive Employment		**28.2%**	**26.8%**	
Wholesale & Retail Sales of Vehicles				
Motor Vehicles, Wholesale	4151	13	13	0.0%
Automobile Dealers	4411	134.3	147.7	10.0%
Total		**147.3**	**160.7**	**9.1%**
% of Automotive Employment		**17.6%**	**18.0%**	
Other Automotive				
Highway, Street and Bridge Construction	2373	57.4	60.8	5.9%
Automotive Equipment Rental & Leasing	5321	17.4	22.6	29.9%
Total		**74.8**	**83.4**	**11.5%**
% of Automotive Employment		**8.9%**	**9.3%**	
Total Automotive Industry		**836.1**	**892.7**	**6.8%**

Source: DesRosiers Automotive Yearbook 2005, Based on Statistics Canada Labour Force Surveys

An important feature of the automotive parts industry is that original equipment manufacturers (OEMs), i.e., the vehicle assemblers, can import parts duty free if they operate an assembly plant in Canada. Hence, trade policy affects only a fraction of the "Motor Vehicle Parts and Accessories Manufacturing" sector. All parts imports that are used in the assembly of new vehicles (OE parts) in North America are exempt from tariffs and hence unaffected by trade policy changes. As such, the import competition Canadian firms face on OE parts will not increase if current tariffs on parts are abolished. To the extent that other countries have extended similar duty exemptions for imported parts that enter locally produced vehicles, Canadian exporters are already exempt from duties on their OE parts exports as well. In addition, Canadian exports of parts are predominantly going to the U.S.; due to NAFTA, these are also not affected by tariffs. This is likely to be the case for aftermarket parts as well.

Only parts that are used in repairs, maintenance, or upgrades of existing vehicle (in the aftermarket sector) are subject to duties. Trade with the U.S. or Mexico—the vast majority of Canadian imports or exports—falls under NAFTA and does not incur duties. Imports from countries with most favoured nation status[37]—the vast majority of trade outside of NAFTA—is subject to tariffs ranging from 0 to a maximum of 8.5%.

In summary, current Canadian import tariffs outside NAFTA are set at 0—8.5% for aftermarket parts, 6.1% for finished cars and light trucks, and 0% for OE parts. Note that such discrimination between finished vehicles, and OE or aftermarket parts is common. For example, China has for a long time provided incentives for local assembly by setting the tariff rate on finished vehicles much higher than for parts (as high as 100%). On April 1, 2005 it overhauled its import regime, classifying complete kits used to assemble vehicles locally with minimal domestic value added as completed vehicles, incurring on average a 30% tariff rate. Parts used in local assembly, on the other hand, only incur 15% tariffs. In its agreement with the WTO, China committed to lowering these rates to 25% and 10.3%, respectively, by mid-2006[38].

Employees listed in the first sector of Table 4.1, "Aftermarket", are mostly engaged in sales, administrative, repair, and maintenance tasks. They are using components but not manufacturing them. Employees making parts will be listed in the NAICS

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[37] With China's inclusion in the WTO in 2001, all Canada's significant trading partners in the automotive industry now enjoy MFN status.

[38] Automotive News, March 28, 2005 "China closes importer's tax loophole."

3363 industry, which employed 140,200 workers in 2004, an increase of 4.8% over 2000. However, the vast majority of those parts is destined to OEM. customers and is largely immune to any trade policy changes because competing imports are not subject to tariffs. However, on the export market it will depend on the tariff treatment of OE parts in overseas destinations. In South Korea, these parts are taxed at 8% and in China at 15%[39]. In order to get an idea of the relative size of aftermarket components in the parts manufacturing industry, we now discuss some trends and summary statistics for the automotive aftermarket.

Table 4.2 lists total retail sales of parts (all figures in billions of CDN$) from 1990 to 2003, the last year for which complete data are available, for the domestic Canadian industry.

Table 4.2 Total retail sales of automotive parts and accessories (at retail prices, billion CDN$)

	Total retail sales of parts	Do-It-Yourself (DIY)	Installed		DIY	installed	labour
			parts	labour	(% of retail sales)		
1990	$10.52	$2.09	$4.64	$3.79	19.9%	80.1%	36.0%
1991	$10.68	$2.13	$4.66	$3.89	19.9%	80.1%	36.4%
1992	$11.40	$2.23	$4.96	$4.21	19.6%	80.4%	36.9%
1993	$11.66	$2.17	$5.09	$4.40	18.6%	81.4%	37.7%
1994	$12.16	$2.25	$5.31	$4.60	18.5%	81.5%	37.8%
1995	$12.27	$2.06	$5.47	$4.74	16.8%	83.2%	38.6%
1996	$12.49	$2.08	$5.59	$4.82	16.7%	83.3%	38.6%
1997	$13.17	$2.18	$5.90	$5.09	16.6%	83.4%	38.6%
1998	$13.08	$1.97	$5.94	$5.17	15.1%	84.9%	39.5%
1999	$13.38	$1.89	$6.09	$5.40	14.1%	85.9%	40.4%
2000	$13.89	$1.90	$6.31	$5.68	13.7%	86.3%	40.9%
2001	$14.40	$2.00	$6.49	$5.91	13.9%	86.1%	41.0%
2002	$15.07	$2.13	$6.79	$6.15	14.1%	85.9%	40.8%
2003	$15.45	$2.21	$6.93	$6.31	14.3%	85.7%	40.8%

Source: DesRosiers Automotive Yearbook (2005)

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[39] A FTA with Korea or China is likely to boost Canadian parts exports. For the results in Table 4.13, we do not distinguish between aftermarket and OE parts because these countries add tariffs to either category.

Over thirteen years, the industry increased sales by 46.9% in nominal terms or 3% per year, cumulatively. This is more or less in line with the rate of inflation for car-related expenses, indicating quantity is almost entirely flat over this period. This is clearly not a growth industry. The increased number of vehicles on the road tends to raise sales, but improved quality of the existing fleet offsets this to a large extent. If customers hang on to their vehicles longer, given the increased reliability, the larger number of cars will eventually lead to greater aftermarket sales. At least in the short run, all net growth for the aftermarket sector has to come from exports.

Breaking down the total retail sales into the "do-it-yourself" (DIY) market, parts customers purchase from retail outlets, and components installed by professional repair stores or at dealerships reveals that the relative importance of the DIY market has declined noticeably. The total value of parts that customers purchased directly has hardly increased in thirteen years. Two-thirds of the increasing share of installed parts is the result of higher labour charges—see the last column of Table 4.2.

The sector is also becoming more competitive at the retail end. Limited to the last ten years of data (1993-2003), Table 4.3 lists aftermarket parts sales at retail (first column) and wholesale (second column) prices. While retail sales increased from $7.26 billion to $9.14, an increase of 25.9% or 2.3% per year, wholesale sales increased by 30.9% from $3.62b to $4.74b, 2.7% per year. The good news for Canadian parts manufacturers is that sales of parts grow more quickly than what one would assume based on retail trends. However, it also reveals that the total (off-the-factory) market is relatively small. In 2003 the total Canadian market for aftermarket parts at wholesale prices is only $4.74 billion dollars, less than a tenth of the total parts market (including OE parts). It also suggests that there is severe price pressure. Retail mark-ups declined, which can be gathered from the increasing ratio of retail to wholesale sales[40]. Finally, the last two columns indicate that more than half of the increase in parts sales can be explained by a larger number of registered vehicles in Canada. Average parts sales per vehicle increased by only 1.1% per year in nominal terms, or $27 cumulatively over the ten year period. Note that parts per vehicle are an increasing function of the age of the vehicle. As a result, countries outside of North America, which tend to have much older fleets than Canada or the U.S., will have larger aftermarket sales per vehicle.

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[40] The importance of the installed parts sector leads to a much larger mark-up than we would expect if all sales were directly to customers—a ratio of 51.9% translates to a 93.7% mark-up.

Table 4.3. Retail and wholesale aftermarket parts sales and sales per vehicle

	Total aftermarket parts sales (DIY and installed)		ratio	registered vehicles	Parts sales per vehicle
	(retail prices)	(wholesale prices)	(retail / wholesale)	(millions)	(wholesale prices)
1993	$7.26	$3.62	49.9%	15.509	$233
1994	$7.56	$3.77	49.9%	15.578	$242
1995	$7.53	$3.77	50.1%	15.871	$238
1996	$7.67	$3.87	50.5%	15.316	$253
1997	$8.08	$4.10	50.7%	16.076	$255
1998	$7.91	$4.03	50.9%	16.322	$247
1999	$7.98	$4.06	50.9%	17.071	$238
2000	$8.21	$4.20	51.2%	17.101	$246
2001	$8.49	$4.35	51.2%	17.668	$246
2002	$8.92	$4.60	51.6%	17.911	$257
2003	$9.14	$4.74	51.9%	18.207	$260

Source: DesRosiers Automotive Yearbook (2005)

Another important trend is the increasing importance of original equipment suppliers (OES), the dealerships associated with the vehicle manufacturers, see Table 4.4. The relentless price pressure in the final vehicle market has reduced dealers' profit margins on new car and truck sales. They have moved downstream and after-sales maintenance and repairs are making up a growing share of their sales. Vehicle companies only took 26% of the total aftermarket parts sales in 1993, but 35.2% in 2003. This has come predominantly at the expense of retailers, while warehouse and distributors—who mostly supply non-dealer installers of parts—have kept their market share at 37.3%. For Canadian suppliers, it means that firms like NAPA or Uni-Select Canada are becoming relatively more important than Canadian Tire or Wal-Mart. Given that the former are industry insiders, while mass-market retailers are eventually marketing to customers directly, this changes the competitive position of Canadian firms relative to foreign competitors. It might be easier to bring factors other than price, such as quality or reliability of supply, into consideration.

Table 4.4. Aftermarket parts sales by distribution outlet

	Total aftermarket parts sales	warehouse /distributor	retail head offices	OES: vehicle companies	(as a % of the total market)		
	(wholesale prices)	(1)	(2)	(3)	(1)	(2)	(3)
1993	$3.62	$1.35	$1.32	$0.94	37.3%	36.5%	26.0%
1994	$3.77	$1.39	$1.37	$1.01	36.9%	36.3%	26.8%
1995	$3.77	$1.39	$1.33	$1.05	36.9%	35.3%	27.9%
1996	$3.87	$1.41	$1.35	$1.11	36.4%	34.9%	28.7%
1997	$4.10	$1.48	$1.31	$1.21	36.1%	32.0%	29.5%
1998	$4.03	$1.47	$1.26	$1.25	36.5%	31.3%	31.0%
1999	$4.06	$1.51	$1.31	$1.29	37.2%	32.3%	31.8%
2000	$4.20	$1.57	$1.26	$1.37	37.4%	30.0%	32.6%
2001	$4.35	$1.64	$1.25	$1.47	37.7%	28.7%	33.8%
2002	$4.60	$1.73	$1.29	$1.58	37.6%	28.0%	34.3%
2003	$4.74	$1.77	$1.30	$1.67	37.3%	27.4%	35.2%

Source: DesRosiers Automotive Yearbook (2005)

Finally, in Table 4.5 we compare the total size of the automotive aftermarket parts market with two benchmarks. In the first column, we replicate the aftermarket retail sales, studied in Table 4.2. The same market at wholesale prices, as in Table 4.3, is replicated in the second column. This is contrasted with the total market for OE parts—those sold directly to vehicle assemblers for installation in new vehicles. In Canada, this market has increased from $45.10 billion in 1998 to $48.09 in 2003. Comparable figures for the North American market, which is almost seven times larger, are in the fourth column. These numbers represent approximately 68% to 70% of the total value of shipments from automobile assembly plants. As Canadian parts suppliers are very much integrated into the North American automobile industry, they compete in a $304.92 billion CDN market when they supply OEMs directly. On the other hand, if they focus on the aftermarket, the entire North American market is likely to be at most one fifth—estimated at $61.7 billion CDN based on U.S. and Mexican registrations[41].

Table 4.5. Relative size of different automotive parts sectors (billion CDN$)

	Demand				Supply	
	Aftermarket parts (Canada)		OE parts		NAICS 3362	
	(retail prices)	(wholesale prices)	Canada	North America	Canada	US
1998	$7.91	$4.03	$45.10	$315.41	$26.04	$273.60
1999	$7.98	$4.06	$55.42	$370.01	$28.58	$301.32
2000	$8.21	$4.20	$56.05	$359.69	$29.89	$303.48
2001	$8.49	$4.35	$49.70	$345.41	$28.59	$289.74
2002	$8.92	$4.60	$50.29	$350.74	$29.69	$317.80
2003	$9.14	$4.74	$48.09	$304.92		

Source: DesRosiers Automotive Yearbook (2005)

When we analyze the impact of trade policy, no separate data are available for OE and aftermarket parts. We only observe trade flows of total parts and also at the industry level we only observe manufacturing for all parts combined (NAICS 3362). Sales of the parts manufacturing sector are listed in the last two columns of 4.5. A couple of ratios should be remembered:

- Aftermarket parts sales in Canada make up 8.97% of the domestic demand for automotive parts (including OE parts).
- At the North American level the comparable fraction is much higher, most likely in the 15–20% range (as Canada has a disproportionate demand for OE parts).
- Canadian parts production only covers 54.1% (in 2002) of domestic demand for parts. In contrast the U.S. and Mexico both run parts surpluses.

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[41] In absence of comparable data to those in column 2 of Table 4.5 for the U.S or Mexico, we estimate the total North American aftermarket by multiplying the average cost of automotive parts per vehicle for Canada, in Table 4.3, by the total registrations in North America.

4.2 Parts manufacturing (NAICS 3363)

When we study the impact of a changed trade policy, we will focus on NAICS industry 3363: "Motor Vehicle Parts & Accessories Manufacturing." Table 4.6 presents total employment statistics for the different sub-sectors.

Table 4.6. Total employment in motor vehicle parts and accessories manufacturing

		Total employment		
NAICS		**1998**	**2002**	**change**
3361	**Motor Vehicle Manufacturing**	**51,440**	**47,495**	**-7.7%**
3362	**Motor Vehicle Body & Trailer Manufacturing**	**17,502**	**19,528**	**11.6%**
3363	**Motor Vehicle Parts & Accessories Manufacturing**	**94,264**	**88,840**	**-5.8%**
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	10,227	10,522	2.9%
336320	Motor Vehicle Electrical [illegible] Electronic Equipment Manufacturing	6,565	6,366	-3.0%
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	6,616	4,792	-27.6%
336340	Motor Vehicle Brake System Manufacturing	7,671	6,556	-14.5%
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	11,090	9,886	-10.9%
336360	Motor Vehicle Seating and Interior Trim Manufacturing	13,130	12,598	-4.1%
336370	Motor Vehicle Metal Stamping	16,133	13,255	-17.8%
336390	Other Motor Vehicle Parts Manufacturing	22,832	24,835	8.8%
3361–63	**Automobile industry (manufacturing)**	**163,206**	**155,863**	**-4.5%**

Source: DesRosiers Automotive Yearbook 2005, based on Statistics Canada Census of Manufacturers

Note that the aggregate statistics differ from those in Table 4.1. While the former are compiled from labour market surveys, the statistics in the current table are the sum of employment of all establishments assigned to the NAICS 3363 industry. Plants that produce more other goods than automotive parts (for example assembly plants where some parts are produced on site) are excluded here, while workers could still denominate their industry as NAICS 3363.

The total parts manufacturing sector employs 87% more workers than vehicle assembly (NAICS 3361): 88,840 versus 47,495. The most important sub-sector, increasingly so over time, is "Other Motor Vehicle Parts Manufacturing", while stamping and seats and interior trim are also very important in Canada. The only two sub-sectors that increased employment from 1998 to 2002 are engines & engine parts and "other parts". By 2002, the latter accounts for 28% of employment in the sector.

Table 4.7. Summary statistics on the motor vehicle parts and accessories sector

		employment share		production workers in employment (%)		value added per production worker		value added per hour worked (prod.)	
NAICS		1998	2002	1998	2002	1998	2002	1998	2002*
3363	Parts	100%	100%	86.5%	85.3%	$139,232	$144,496	$65.34	$67.81
336310	engine	10.8%	11.8%	85.2%	88.5%	$337,637	$177,734	$143.06	$75.31
336320	electrical	7.0%	7.2%	88.1%	83.2%	$117,731	$101,952	$57.86	$50.11
336330	steering & suspension	7.0%	5.4%	87.2%	88.0%	$118,823	$150,977	$55.49	$70.50
336340	braking	8.1%	7.4%	87.8%	84.8%	$123,256	$117,703	$60.45	$57.73
336350	transmission	11.8%	11.1%	87.4%	83.4%	$143,750	$191,659	$62.83	$83.77
336360	interior	13.9%	14.2%	87.7%	87.2%	$120,589	$149,695	$58.77	$72.96
336370	stamping	17.1%	14.9%	86.2%	85.7%	$109,222	$141,341	$53.61	$69.38
336390	other	24.2%	28.0%	85.0%	83.6%	$98,447	$126,541	$46.42	$59.67

Source: own calculations based on DesRosiers Automotive Yearbook (2005) and Statistics Canada

In Table 4.7 we calculate a number of crucial summary statistics for the different sub-sectors. The share of production workers in employment is declining slightly over time in most sectors. This trend is particularly pronounced in electrical & electronic equipment manufacturing and the important "other parts" sub-sectors and could indicate an increasing level of technical sophistication. The average value added per production worker increased only slightly from $139,232 in 1998 to $144,496 in 2002, but this masks big differences between sectors. The highly capital intensive engine & engine parts sector operated in 2002 at less than 53% of its value added of 1998. Inspection of the different components that enter these calculations reveals that this is the result of increased purchases of parts and materials, up 58%, while employment and total shipments increased only slightly.

Two more sectors saw their value added per worker slump, albeit not as drastically. The electrical & electronic equipment and braking sectors saw (nominal) declines of 13.4% and 4.5% respectively.

Two factors contributed positively towards aggregate value added growth for the industry. First, even though the engine sector saw its labour productivity decline, it is still above the industry average. Given that it increased its share of parts employment from 10.8% to 11.8% this relative reallocation of workers increased aggregate productivity. Second, labour productivity growth is positive and large in the remaining sectors. Average productivity growth is 28.5% over four years or 6.5% per year, if it is positive, ahead of the average growth for the manufacturing sector. The steering & suspension, transmission, and stamping sectors achieved this productivity growth by reducing total employment and keeping value added more or less constant. The seats & interior trim kept its employment constant, but increased its share of total parts manufacturing employment. Finally, the "other parts" industry increased labour productivity by 28.5%, while at the same time employing 1350 more workers. Finally, in the rightmost columns we calculate labour productivity per hour worked where the same trends are apparent. Normalizing by the average number of hours worked in each sub-sector, the same trends show up, but the dispersion across industries at each point in time is reduced.

4.3 Threats and opportunities

4.3.1 Threats

Before analyzing the impact of trade policy changes, we briefly discuss the most pressing threats and opportunities faced by the Canadian automotive parts industry. We draw from industry coverage in the weekly *Automotive News* magazine and a survey of Canadian parts manufacturers organized jointly by the Canadian Auto Parts Manufacturers Association (APMA) and the Asia Pacific Foundation of Canada[42].

The most obvious threat to Canadian firms in the last couple of years is the appreciating Canadian dollar. The Canadian-U.S. **exchange rate** moved from a low of 0.618 on January 21, 2002 to a high of 0.885 on March 2, 2006. That is an appreciation of 43.2% in only four years. Given that the U.S. is by a wide margin Canada's largest trading partner this matters a lot. In addition, some export contracts to other countries are likely to be priced in USD as well.

While such exchange rate movements make Canadian suppliers less competitive internationally, they also hurt firms on their existing contract if **contractual prices** are specified in U.S. dollar terms. With volatile exchange rates, raw material prices (see below), and customers' market shares (see below), it becomes crucial not to be pinned down by fixed nominal prices in long term contracts.

Prices of raw materials, especially steel and oil, but other metals as well, have also increased enormously in recent years. These have been cited in most prominent U.S. Chapter 11 bankruptcy filings, e.g., Tower Automotive and Collins & Aikman. Of course, the extent to which firms are affected depends again on whether they are compensated for this. In the case of Tower Automotive, its customers have only agreed to change the agreed prices to reflect higher input costs of steel after the firm filed for bankruptcy.

Market share of traditional (Big 3) customers[43] is declining. Most domestic suppliers tend to have a disproportionate exposure to these firms. In addition, each of these firms is running a very aggressive cost-cutting program to reduce their input purchase bills.

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[42] "The East Asian Automobile Industry: Opportunity or Threat? Results of a Survey of the Canadian Auto Parts Manufacturers," Canada in Asia report, January 2005.

[43] Throughout, we will be referring to the "Big 3" to indicate GM, Ford, and DaimlerChrysler; traditionally the largest three OEM customers in North America.

For example, in 2004 it took Ford almost a year to convince some of its global suppliers to sign the new contracts. In addition to severe price cutbacks, major concerns were raised by stipulations in the contract that allowed Ford to hand R&D work over to competitors. **Ownership of IP** is quickly becoming an important part of sourcing relationships. For example, in 2005 Multimatic sued Faurecia alleging it sourced a proprietary design with a competitor to get a lower price. With the rise of China's manufacturing capabilities, conflicts over IP are rising overseas as well.

A more general problem is that contracts often specify a fixed price per part. Firms spread out **fixed investment costs** over the expected model run. If a model proves less successful than anticipated, the contracted average price will not allow firms to recover their fixed setup costs. As suppliers are shouldering more of the R&D burden, this problem is becoming more widespread.

Not surprisingly, **import competition** was also cited by Canadian suppliers as one of the most significant threats. The two countries mentioned most often were the U.S. and China.

FDI by foreign suppliers who followed OEM transplants to North America is also perceived as a threat by domestic firms. For example, even before Toyota announced its intention to build a new assembly plant in Woodstock, Ontario, its seat supplier Araco of Japan opened a seat and interior trim plant in Ontario to keep up with Toyota's production expansion in North America. Similarly, Honda suppliers like Musashi Seimitsu (suspension and steering parts) or Ube (wheels) are expanding in Ontario to serve customers besides Honda as well.

On the export front, many firms also mention **difficulties exporting to the U.S.** This covers both concerns about insufficient (government) investments in border infrastructure as well as rising U.S. protectionism in the wake of 9/11.

4.3.2 Opportunities

Luckily, not everything is grim in the outlook of Canadian suppliers. One of the most frequently cited opportunity is the **expansion of production overseas**, especially in China. The vast majority of Canadian suppliers, 64%, have been asked by their North American clients to expand production capacity overseas to serve them better in locations abroad. Given that net growth in worldwide demand for new vehicle is predominantly outside of North America, it clearly makes sense to focus on developing countries.

In addition, many firms perceive foreign expansion as a way to attract new customers. The expectation is that these relationships will eventually translate into new supplier contracts to **North American transplants** as well.

In contrast to what one would gather from reports in the media, lowering costs is not one of the main motivations to **increase foreign sourcing**. Access to important customers, strategic geographic positioning, and strategic fit (patents, R&D, staff) all rank higher than cost considerations.

In contrast with the focus on **Asia**, which more than 70% of Canadian suppliers perceive as an opportunity, the Free Trade Area of the Americas does not seem high on the radar screen, neither as a threat nor as an opportunity.

As mentioned in section 1, Canada has considerable expertise in **fuel cell** research. In addition, from early on the R&D efforts have been well plugged in to the automotive industry. Once the technology is ready for prime time, Canada is expected to be one of the major players (in sharp contrast with the hybrid technology which will only come to Canada in 2010).

The Canadian industry has frequently argued that in order to be globally competitive and form a thriving industry it needs a solid base. Most directly, expansion of **assembly capacity** of final vehicles in Canada was a prime objective—communicated very clearly by the Canadian Automotive Partnership Council. The investments by Ford in Oakville, the commitment to keep St. Thomas open (at least in the short run), the current negotiations to avert some of the announced capacity reductions at

GM's Oshawa facility, and especially Toyota's announcement to build a new plant in Ontario are all very encouraging.

OEMs are **increasingly outsourcing** more steps in the production process. This can both be a threat and an opportunity for suppliers. As mentioned earlier, the success of these outsourcing relationships hinges crucially on the contractual details. For example, DaimlerChrysler is compensating Karmann when the demand for the Crossfire vehicle that Karmann assembles fell off more quickly than expected. Without such guarantees, outsourcing becomes a risky endeavour for suppliers. If structured properly, these outsourcing trends open up new growth opportunities in an otherwise mature industry.

4.4 Industry structure

4.4.1 Exit

The difficulties in the industry have led to a large number of bankruptcies in the U.S., where 138 of the top 150 North American suppliers have their headquarters (including regional headquarters). Table 4.8 lists the thirteen largest bankruptcies by U.S. suppliers in the past 5 years. Eight U.S. companies that were among the 100 largest OEM parts suppliers worldwide filed for Chapter 11 restructuring, which is almost a quarter of the 34 U.S. companies on the list. A further five Tier 1 suppliers went under that did not make the global list, but are listed (or at least have been recently) on the list of 150 largest North American suppliers. Note that these companies often suffered a couple of years of declining sales before filing, at least relative to more successful companies, and their 2004 rank understates their importance. For example, Amcast ranked as high as 82 in North America in 1993 and 122 in 2003, but fell off the list in 2004.

Among the list of bankrupt companies, firms headquartered in Michigan are very prominent, firms producing steel-intensive products, stampings, castings, or frames, are also overrepresented. Federal-Mogul and Hayes Lemmerz International filed a couple of months after the 9/11 terrorist attacks when the U.S. seemed heading for a recession and these companies had trouble servicing their debt. The other bankruptcies are more recent, with filings accelerating at the end of 2004. Total output in the North American automobile industry was still going strong—it still is—but these firms were exceedingly exposed to raw material prices, the sales decline of the traditional Big 3 (U.S.) OEMs, and import competition.

Table 4.8. Recent major bankruptcies by U.S. automotive parts suppliers

Firm	Headquarters	filed for Chapter 11	World-wide rank (2004)	Global OEM parts sales	Employment
Delphi Corp.	Troy, MI	Oct-05	1	$28.60	185,200
Dana Corp.	Toledo, OH	Mar-06	15	$9.06	46,000
Collins & Aikman Corp.	Troy, MI	May-05	20	$3.98	23,000
Federal-Mogul Corp.	Southfield, MI	Oct-01	39	$3.35	42,000
Tower Automotive Inc.	Novi, MI	Feb-05	45	$3.20	12,000
Hayes Lemmerz International	Northville, MI	Dec-01	64	$2.00	11,000
Oxford Automotive	Troy, MI	Dec-04	98	$1.08	3,800
Meridian Automotive Systems	Dearborn, MI	Apr-05	99	$1.03	5,900
			NA rank (2004)	**Global OEM parts sales**	
J.L. French Automotive Castings Inc.	Sheboygan, WI	Feb-06	102	$0.50	1,800
Intermet Inc.	Troy, MI	Sep-04	68	$0.70	5,200
Citation Corp.	Troy, MI	Sep-04	79	$0.60	5,200
Key Plastics, LLC	Northville, MI	Mar-00	132	$0.70	4,000
Amcast Industrial Corporation	Fremont, IN	Dec-05	N/A	$0.42	2,600
Total				**$55.22**	**347,700**

Notes: Ranks are from the Automotive News list of 100 largest suppliers worldwide or 150 largest suppliers in North America. Sales are global OE parts in 2004 in billions of USD. Employment statistics are the latest available (generally 2005).

The scale of this wave of bankruptcies is unprecedented. The thirteen largest filings accounted for annual sales of $55.22 billion USD in 2004 and an even higher volume in the preceding years. This number only includes OE parts sales, with total sales often much larger still. At the time of this writing, these companies employed a total of 347,700 employees[44]. While it is unlikely that much of the production capacity and associated jobs will be liquidated, many workers will have to transition into new jobs and have to take pay cuts.

Furthermore, this is certainly not the end of the restructuring in the parts industry. Lear Corp., the 5th largest supplier in North America, is struggling to make its debt payments and its market value plunged by more than 60% in the preceding year as more analysts see a Chapter 11 filing as a distinct possibility. Lear employs 115,000 workers worldwide. A bankruptcy by Visteon, currently employing 49,000 full time employees, was only narrowly avoided courtesy of a very generous payout package by its former parent. Some plants were transferred back to Ford, which is trying to sell them off, and some workers also transferred back to Ford. While the old Visteon employed 70.2% of its workers in the U.S., the restructured Visteon counts 56.1% Mexican workers in its hourly workforce. Only 12 of its plants remain organized by the UAW, the principal labor union in the U.S. automotive industry[45]. Delphi counts approximately 60,000 hourly employees at its 50 Mexican plants.

The bankruptcy of Delphi, the largest supplier worldwide, is likely to have wide-ranging effects on the industry. The tiered organization of the supply chain means that financial problems at a large Tier 1 supplier trickle down to the next levels very quickly. If Delphi defaults on some of its trade credit, some of its suppliers that are already stretched by the increased competition would have a hard time surviving. The wave of Tier 1 firm bankruptcies in Table 4.8 has led a lot of smaller suppliers to file for Chapter 11 restructuring as well. An incomplete list is in Table 4.9.

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[44] Delphi employs 185,200 employees worldwide and 76,000 in the U.S. 42 of its U.S. corporate entities are involved in the restructuring.

[45] Automotive News, June 20, 2005, "New Visteon has Mexican flavor".

Table 4.9. Recent bankruptcies by smaller U.S. automotive parts suppliers

Year	Smaller suppliers filing for bankruptcy
2006	Hastings Manufacturing Company
2005	American Remanufacturers Inc.; Allied Holdings, Inc; Metalforming Technologies Inc.; Trim Trends Co. LLC.; BBi Group
2004	Andover Industries
2003	Liteglow Industries, Inc.
2002	Harvard Industries, Inc.
2001	Rankin Automotive Group, Inc.; Valeo Electrical Systems, Inc
2000	Cambridge Industries, Inc.; Safety Components International, Inc.; Dorsey Trailers, Inc.; Safelite Glass Corporation

Another notable outgrowth of the supplier distress is that Delphi managed to negotiate a two-tiered wage system in its 2003 labour contract negotiations with the UAW[46]. This allows the company to pay new workers lower wages than its existing employees. The union has always resisted such discrimination, even though the OEMs have repeatedly pushed for this as well. It remains to be seen how important this change will turn out to be in practice.

Quite remarkably, Canadian firms have survived this carnage almost scot-free. Given the increased cost pressure induced by the adverse exchange rate movement, the rising importance of the U.S. border in the post 9/11 world, and the traditional over-exposure to the Big-3 traditional customers for Canadian firms, one could have expected even more problems than in the United States.

4.4.2 Concentration

While a lot of large firms are in financial difficulty, total industry concentration has clearly been increasing. Figure 4-1 plots the evolution in the share of the total material cost for the motor vehicle assembly industry (NAICS 3361) in the U.S. and Canada combined that is accounted for by different groups of firms[47].

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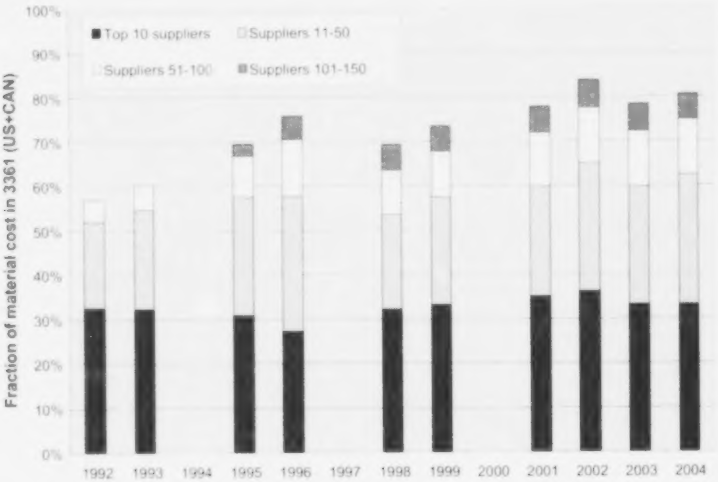
[46] Automotive News, September 29, 2003, "UAW gives Delphi half a loaf."

Figure 4-1 Top suppliers' sales as a fraction of total material cost in NAICS 3361 (US + Canada)



The share of OE parts sales in North America by the 100 largest suppliers, the longest time trend is available for this group, increased from 57% in 1992 to 75% in 2004. The bottom bars in each column, which track the sales of the top 10 suppliers, indicate that the increase is not caused by the very top firms. They kept their share approximately constant at one third. The largest increase is for firms in the second group, suppliers ranked 11 to 50 on the North American supplier list. This group increased its share from 19.4% to 29.2%, an increase of almost 50%. In order to break the top 50 in 2004, a firm had to sell $1 billion worth of OE parts.

In 1992 this would have secured the 21st spot on the list! Given the very moderate price increases in the industry—as documented earlier—firms are clearly becoming much bigger. The next group of suppliers, ranked 51 to 100, only sold 4.8% of North American automotive materials, but 12.5% in 2004—an increase of 160%.

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[47] Given that the share of Mexico in North American production has increased over time, the increase in concentration for the total North American industry will be slightly lower, but the difference will be very small.

These patterns have two important consequences. In the tiered supplier system that is now in effect, only a couple of hundred firms have access to the final vehicle manufacturers. They decide which firms to outsource components to further down the line. For the vast majority of firms in the industry, relationships with these large tier 1 suppliers are crucial. Among the 150 largest suppliers were 9 Canadian firms in 1999, but only 7 remain. Four are in the top 100, versus 5 in 1999. The enormous expansion of Magna, which moved from the 7th spot in 1993 to 3rd in 2004, has increased the Canadian share on the list, but at the same time it concentrates a lot of Canadian automotive employment in a single company.

I have documented elsewhere[48] that the location of supplier headquarters is increasingly concentrated in Michigan. Several firms that used to operate regional headquarters in Canada have centralized their headquarters activities in their U.S. headquarters. Moreover, the number of Mexican, European, and Japanese suppliers on the list has crept up over time as well. All these factors imply that decisions about (overseas) outsourcing are increasingly being made outside of Canada, even though these decisions have an important impact on the Canadian industry.

An important reason for suppliers to become bigger has been the larger role in R&D that they have assumed in recent years. In order to diversify risk and to spread fixed costs of the development of new technologies over a larger volume of sales, scale is important. The relatively diminished role of Canadian firms in the upper echelons of the parts sector is likely to have an impact on the extent to which innovative activities are carried out in Canada.

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[48] Van Biesebroeck J. (2006), "Trends and Complementarities in the Canadian Automobile Industry, (*forthcoming*) in Z. Chen and M. Duhamel, Industrial Economics and Performance in Canada.

4.5 Import demand and export supply

4.5.1 Elasticities

In order to assess the effect of trade liberalization on the domestic Canadian market and the export potential of Canadian firms overseas, we need estimates of the demand and supply elasticities for the different sub-sectors of the automotive parts industry. Methods to estimate demand elasticities in differentiated goods market developed in the industrial organization literature tend to be too data intensive to be widely applicable. In section 3 we estimated such a model for the Canadian final vehicle market and the data requirements clearly exceed what can conceivably be obtained for the parts industry.

In recent years, the international trade literature has also taken the fact that goods are differentiated more seriously and more reliable elasticity estimates are obtained exploiting properties of the constant elasticity of substitution (CES) demand system. A paper by Feenstra (1994) pioneered the approach and the estimation method was subsequently refined and applied to a much wider range of industries (products) by Broda and Weinstein (2006)[49]. The benefit of this approach is that demand estimates control explicitly for heterogeneity across goods, albeit in a restrictive way. The method can also deal with increasing variety and with quality or taste differences across goods or country of origin.

The estimates have been used to calculate the value of increased variety as an additional gain from trade. For example, Broda and Weinstein (2006) estimate the contribution of unmeasured growth in product variety in U.S. imports between 1976 and 2001 to be approximately 2.6% of GDP. They also find that the "true" import price index increases 1.2% per year more slowly—approximately one quarter of the annual increase—because of the increase in variety.

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[49] Feenstra, R. (1994), "New Product Varieties and the Measurement of International Prices," *American Economic Review*, 87 (1), March, pp. 157-177 and Broda, C. and D. E. Weinstein (2006), "Globalization and the Gains from Variety," *Quarterly Journal of Economics*, 121(2), *forthcoming*, May.

A similar exercise on the export side, see Feenstra and Kee (2004, 2005), models a nation's output using a CES cost function that is decreasing in the number of varieties. An increase in variety in a sector will raise the sectoral price index and draw resources to the industry. An empirical application finds that in a cross section of countries, productivity levels are positively correlated to the number of varieties that are exported to the U.S. Over time, the relative evolution of a nation's productivity level is found to be similar to the evolution of its variety in exports.

For details on the methodology, we refer the interested reader to the papers by Feenstra (1994) and Broda and Weinstein (2006). Here we just provide a brief explanation of the underlying theory and some details on our implementation. Underlying the theory is a three-tiered CES utility function. At the upper level, consumers have preferences over two composite goods, one domestically produced and one imported:

$$U_t = \left(D_t^{\frac{\kappa-1}{\kappa}} + M_t^{\frac{\kappa-1}{\kappa}} \right)^{\frac{\kappa}{\kappa-1}}, \quad \kappa > 1.$$

D is the domestic good and the import composite, *M*, will be defined below. κ is the elasticity of substitution between the two goods. If this is equal to the elasticity of substitution between different imported varieties, the upper nest disappears[50].

In the second tier, the composite import good is defined as:

$$M_t = \left(\sum_{g \in G} M_{gt}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}}, \quad \gamma > 1$$

where M_{gt} is the sub-utility derived from the consumption of the imported good *g* in time *t*; γ denotes the elasticity of substitution among the imported goods, and *G* is the set of all imported goods.

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[50] This is what one has to assume to use the model to investigate the impact of trade liberalization on the domestic industry; otherwise consumers allocate a fixed proportion of their budget to domestic and imported goods.

At the most detailed level, different varieties (c) are imported of each good (g) and we can use the non-symmetric CES utility function to define M_{gt}:

$$M_{gt} = \left(\sum_{c \in C} d_{gct}^{\frac{1}{\sigma_g}} m_{gct}^{\frac{\sigma_g - 1}{\sigma_g}} \right)^{\frac{\sigma_g}{\sigma_g - 1}} , \quad \sigma_g > 1 \quad \forall\, g \in G$$

For each good, imports are treated as differentiated across countries of supply. Tastes for varieties can differ or, alternatively, d_{gct} can represent heterogeneous quality levels for imports coming from different countries.

A major attraction of this framework is that one can construct a price index using the theory of exact index numbers without having to estimate the different taste or quality parameters (d_{gct}), only the elasticities of substitution. If a good is consumed (imported) even though its quality or desirability is lower than that of other goods, this difference has to be reflected in the price. Using expenditure shares one can aggregate prices to construct an exact price index. Note that for the demand system to be well-behaved, all elasticities of substitution have to exceed unity.

The demand system can be manipulated to find an explicit expression for the import demand equation for each good. Differentiating with respect to time gives the following demand equation in first differences:

$$\Delta \ln s_{gct} = \varphi_{gt} - (\sigma_g - 1)\Delta \ln p_{gct} + \varepsilon_{gct}$$

where φ_{gt} is a function of the same variables that enter the price index for good g and does not differ across the country of origin (it is a random effect in the demand equation). $\varepsilon_{gct} = \Delta \ln d_{gct}$ is the random term in the regression and can be interpreted as taste or quality shocks across import destination.

The export supply equation is specified exogenously, but allowed to vary with the amount of exports:

$$\Delta \ln p_{gct} = \psi_{gt} + \frac{\omega_g}{1 + \omega_g} \Delta \ln s_{gct} + \eta_{gct}$$

where $\varphi_{gt} = -\omega_g \Delta \ln E_{gt} / (1+\omega_g)$; $\omega_g \geq 0$ is the inverse supply elasticity, assumed to be constant across countries and $\eta_{gct} = \Delta \ln v_{gct} / (1+\omega_g)$ captures any random change in a technology factor v_{gct}. A special case of this supply equation would be a horizontal, perfectly elastic supply, in which case $\omega_g = 0$.

Obviously, the system of demand and supply is not identified without instruments or identifying restrictions. Lacking instruments for the entire range of industries we would like to estimate this system for, we instead assume that $E(\varepsilon_{gct}\, \eta_{gct}) = 0$, i.e. once good-time specific effects are controlled for, demand and supply errors at the variety (destination country) level are assumed to be uncorrelated.

Details of the estimation procedure follow Leamer (1981)[51]. Both equations are normalized by a reference variety (k) and parameters are estimated from the second moments in the data. The estimation equation becomes:

$$(\Delta^k \ln p_{gct})^2 = \theta_1 (\Delta^k \ln s_{gct})^2 + \theta_2 (\Delta^k \ln p_{gct} \Delta^k \ln s_{gct}) + u_{gct}$$

where

$$\theta_1 = \frac{\omega_g}{(1+\omega_g)(\sigma_g - 1)}, \quad \theta_2 = \frac{(1-\omega_g)(\sigma_g - 2)}{(1+\omega_g)(\sigma_g - 1)}, \quad \text{and } u_{gct} = \varepsilon^k_{gct} \eta^k_{gct}$$

All the k superscripts indicate differencing by the corresponding variable for the kth reference country. In order to recover the structural parameters of interest σ_g and ω_g, we have to solve the nonlinear system of equations. For some parameter values, there will only be imaginary solutions, which obviously do not make economic sense. The endogeneity of the price on the right-hand side is solved by instrumenting with country dummies, see Feenstra (1994) for details on the practical implementation of the weighted IV estimator.

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[51] Leamer, E. (1981), "Is it a Demand Curve, or Is It a Supply Curve? Partial Identification through Inequality Constraints," *Review of Economics and Statistics*, 63(3), pp. 319-327.

To assess the reasonableness of these parameter estimations we present our estimates for the σ_g parameters in 4.10, side by side with the estimates obtained by Broda and Weinstein (2006). We follow these authors by including different goods in the same SITC 3-digit sector imported from one country as different varieties. We present estimates for all automotive sectors (broadly defined). The first two columns replicate the demand elasticities that Broda and Weinstein (2006) obtained using a GMM estimator that avoids the risk of finding imaginary values for any of the structural parameters by doing a grid search restricted to the allowable interval. In the next column we present our results using the same data, made available by Feenstra[52]. In the fourth column, we replicate the analysis on a more recent data set we purchased from Global Trade and Information Services, Inc. The latter spans the 1995-2005 period.

Table 4.10. Demand elasticity estimates at the SITC 3-digit level

SITC (Revision 3)		Broda & Weinstein		Replication	GTIS data:'95-'05	
		('72-'88)	('90-'01)	('90-'01)	(1)	(2)
621	materials of rubber	3.52	2.67	1.77	2.31	2.29
625	rubber tires	2.18	1.98	3.70	4.96	3.10
713	**internal combustion engine**	**25.03**	**2.69**	**3.46**	**3.21**	**2.42**
781	motor vehicles for passengers	1.63	3.02	15.55	2.21	2.48
782	motor vehicles for goods	103.03	6.70	5.00	9.46	N/A
783	road motor vehicles, n.e.c.	10.59	3.82	7.71	367.44	N/A
784	**parts and accessories for MV**	**7.76**	**2.79**	**2.04**	**1.48**	**1.68**
785	motorcycles and bicycles	1.30	1.15	2.52	1.83	2.08
786	trailers	3.73	1.89	2.00	1.77	1.87
Nobs		246	256	9	9	7
Mean		6.78	4.01	4.86	43.85	2.28
St.Dev (Mean)		1.19	0.50	1.48	40.46	0.18
Median		2.54	2.24	3.46	2.31	2.29
Max		1.08	1.05	1.77	1.48	1.68
Max		228.75	108.19	15.55	367.44	3.10

Notes: The first three column use data available online through the NBER website. The last two columns replicate the same analysis using more recent data from the Global Trade Atlas, compiled by Global Trade Information Services, Inc. (1): normalization by largest Canadian hs10 product, in terms of trade volume; (2): normalization by smallest Canadian hs10 product.

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[52] http://cid.econ.ucdavis.edu/data/sasstata/usiss.html

In each estimation, market shares are calculated using reported import values for the U.S., omitting re-exported goods. Prices are constructed as unit values, dividing the value of imports by quantity. Ideally, we would like to carry out the estimation for Canada as well, but for the automotive parts, all goods starting with 8708 in the Harmonized System of trade classification had missing quantities.

Simply comparing the results in the first two columns, the Broda and Weinstein (2006) results already indicate that estimates are not always robust over time. For example, motor vehicles for goods transport have an estimated elasticity of 103 in the early period 1972 to 1988, basically indicating these are homogenous goods. In the later period, 1990 to 2001, the elasticity declines to 6.70 indicating some differentiation—optimal monopoly mark-ups would increase from less than 1% to 17.5%. While it is not entirely impossible that these goods have changed this much over time, it is doubtful. For some other goods, the parameters are much more stable over time. For example, the demand for rubber tires and motorcycles & bicycles is estimated to be highly inelastic in both periods.

For some goods our results are relatively close to the ones obtained by Broda and Weinstein (2006), but this is not always the case. Most pertinent for this section are the estimates for the internal combustion engine & parts sector (SITC 713) and motor vehicle parts & accessories (SITC 784), which are both indicated in bold. Our results are relatively close. For a lot of goods, Broda and Weinstein (2006) find a declining trend in the elasticities, indicating increased product differentiation over time. We find similar results and extending the data set to 2005, results in the fourth column, tends to lower the elasticities further.

Because the estimation procedure is nonlinear, the results might be sensitive to the normalization chosen. We have always normalized by a Canadian good, because the U.S. has positive imports from Canada in the largest set of products throughout the entire sample period and also in terms of market share Canada is important and stable over time. However, at this aggregate level we lump a lot of products (at the most detailed 10-digit HS classification) together when we carry out the estimation for each SITC 3-digit industry separately. In the fourth column, we normalize by the Canadian product with the largest market share, while in the fifth column the estimation procedure is identical, only now we normalize by the Canadian product with lowest market share. Results are somewhat sensitive to this normalization, but there is no consistent direction for the bias. Also note that with this alternative normalization we cannot obtain the demand elasticities for industries 782 and 783.

To gauge whether the results are still reasonable when we carry out the estimates at finer levels of aggregation, Table 4.11 contains the demand elasticities for the detailed sub-sectors in engines & engine parts (SITC 713) and automotive parts and accessories (SITC 784). In the first two rows we repeat our estimates from the 3rd and 4th column of Table 4.10, for the aggregate sectors, and we add the estimates of the supply elasticities as well. One pattern that seems to come out of this is that goods with a high demand elasticity tend to have a lower supply elasticity. Combinations of high demand and supply elasticities, which would give rise to large quantity volatility over time, seem to be rare. Similarly, we only find a single good with a demand elasticity below the median that also has a supply elasticity below the median (motor vehicle bodies, SITC 78421). A situation like this is likely to lead to high price volatility over time when either of the curves shifts.

Overall, the estimates seem reasonable. The median demand elasticity across all parts sectors is 2.53 in the 1990-2001 period and 2.70 in the 1995-2005 period. The averages are larger because some sectors are estimated to have much lower product differentiation, while the estimate for the demand elasticity can never fall below 1 (to be consistent with the model). Median supply elasticity is 0.78 in the 1990-2001 period, notably below infinity (the perfectly competitive benchmark). This makes sense: as we estimate that products are differentiated, it makes sense to find that the supply curve is not entirely horizontal. We also find that the supply elasticity declined in the later period. The median declined to 0.36 and, omitting the outlier motor vehicle engines with spark-plugs larger than 1000cc (SITC 71322), the average supply elasticity also declined from

0.82 to 0.65. Increased product differentiation seems to make it harder for firms to quickly scale up production. Increased foreign competition would tend to increase the supply elasticity.

Table 4.11. Demand and supply elasticity estimates at the SITC 5-digit level

	Feenstra data(1990-2001)		GTIS data (1995-2005)		
	demand	**supply**	**demand**	**supply**	**description**
713	3.46	0.33	3.21	0.38	
784	2.04	0.97	1.48	1.61	
71321	(b)	(b)	(b)	(b)	MV engine – spark < 1L
71322	2.59	2.48	2.31	19.8	MV engine – spark > 1L
71323	(a)	(a)	8.83	-0.3	MV engine – diesel
71381	8.71	0.02	6.97	0.75	engine other, spark
71382	7.36	0.14	(a)	(a)	engine other, diesel
71391	2.52	0.78	2.03	0.97	parts – spark
71392	2.27	0.41	2.51	0.35	parts – diesel
78410	(a)	(a)	36.92	0.35	chassis with engine
78421	2.06	1.44	(b)	(b)	MV bodies
78425	(a)	(a)	9.57	0.21	other bodies
78431	2.38	0.81	2.9	-0.15	bumpers
78432	1.6	0.86	1.64	0.95	other parts of bodies
78433	4.31	-0.17	2.3	0.29	brakes
78434	1.94	3.32	1.95	3.38	gearboxes
78435	3.14	2.27	6.07	0.01	drive-axles
78436	2.86	-0.23	5.23	0.38	non-driving axles
78439	2.53	0.21	1.63	1.22	other MV parts
Nobs	**13**	**13**	**14**	**14**	
Mean	**3.41**	**0.95**	**6.49**	**2.01**	
St.Dev (Mean)	**0.6**	**0.31**	**2.45**	**1.39**	
Median	**2.53**	**0.78**	**2.7**	**0.36**	
Min	**1.6**	**-0.23**	**1.63**	**-0.3**	
Max	**8.71**	**3.32**	**36.92**	**19.8**	

Notes: (a) imaginary number; (b) no data

Finally, in Table 4.12, we also show the demand and supply elasticities estimated at the 6-digit level of aggregation for the Harmonized System of trade classification. This is the level of detail that we will use to simulate the impact of the changed trade policy. The same products as in Table 4.11 are included.

Table 4.12. Demand and supply elasticities at the 6-digit HS classification

	Feenstra data (1990-2001)		GTIS data (1995-2005)	
Harmonized System	**Demand**	**Supply**	**Demand**	**supply**
8407-8409	3.53	1.09	3.16	0.81
8708	2.03	0.59	1.47	1.30
840730	2.07	-2.69	2.56	303.74
840731	3.91	-0.47	2.00	2.52
840732	6.11	0.75	10.08	1.36
840733	4.48	0.31	26.49	1.11
840734	2.59	2.48	2.31	19.80
840790	8.71	0.02	6.97	0.75
840820	(a)	(a)	8.53	-0.30
840890	7.36	0.14	(a)	(a)
840991	2.88	1.28	1.89	4.91
840992	2.81	0.77	2.31	0.64
840999	2.25	1.29	2.51	0.35
870810	2.38	0.81	2.90	-0.15
870820	2.96	1.75	(b)	(b)
870821	(b)	(b)	4.80	0.02
870829	1.55	0.44	1.64	0.95
870831	4.60	2.05	1.85	3.44
870839	3.22	-0.10	3.22	-0.52
870840	1.94	3.32	1.95	3.38
870850	3.14	2.27	6.07	0.01
870860	2.86	-0.23	5.23	0.38
870870	3.38	-0.20	1.85	1.43
870880	1.77	3.30	2.82	0.39
870891	1.84	-7.11	1.80	5.17
870892	2.37	1.05	1.53	2.03
870893	2.14	0.17	1.43	4.18
870894	2.04	0.16	1.89	-0.24
870899	2.29	0.02	1.87	0.84
HS 6-digit				
Nobs	27	27	27	27
Estimated	25	25	25	25
# of varieties (median)	40	40	39	39
Mean	3.27	0.46	4.26	14.25
St.Dev (Mean)	0.36	0.41	1.04	12.09
Median	2.81	0.44	2.31	0.95
Min	1.55	-7.11	1.43	-0.52
Max	8.71	3.32	26.49	303.74

Notes: (a) imaginary number; (b) no data

With the exception of a few outliers, the estimates are now very similar for the two time period. Engines & engine parts, those components starting with 8407, 8408, or 8409 seem less differentiated than other automotive parts. They have larger demand elasticities, although the supply elasticity is only estimated to be larger in the earlier period.

4.5.2 Export potential

Using the U.S. estimates in the previous section as indicative of the demand and supply estimates for all exporters in all markets, we can simulate what the impact of a trade agreement would be on Canadian exports. While it might seem like a strong assumption to use the U.S. estimates for other countries, it is not that farfetched in this case. The production technology used in the automotive industry is the same the world over. The same firms are also operating assembly plants in all of the regions we will investigate and in the U.S. This should make the demand elasticity estimates—which are input factor demands—comparable. Moreover, the Canadian industry is the most important trading partner of the U.S. and supply elasticities identified from U.S. imports should be highly representative of the Canadian industry. As such, the supply elasticities should be equally valid. Note that for the estimates in the previous section to be valid, we had to assume anyway that supply and demand elasticities were identical across countries. If countries differ substantially in technology, this will show up in the relative importance of different goods in their trade flows[53].

To calculate the impact of an elimination of tariff rates under FTAs between Canada and different countries, we exploit the properties of the CES demand system that underlies our elasticity estimations. A good reference for the crucial equations is Melitz (2003)[54]. In the CES model, mark-ups will be constant for all producers as each firm/country faces a residual demand curve with the same elasticity of substitution (which differs by product). Price will be set by the following mark-up pricing rule:

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[53] As mentioned earlier, we were unable to carry out a similar estimation for Canada, as quantity data was not available. For the U.S. trade flows, the Feenstra data has missing observations for physical quantity (import values are always available if trade flows are positive) in less than 10% of the observations. In the Trade Analyzer Database of Statistics Canada, the automotive parts information had more than 95% of the quantities missing (finished vehicles were reported in physical units).

$$p_{ct} = c_{ct}(1+t)\frac{\sigma}{\sigma - 1},$$

where c_{ct} is the marginal cost of production (including transportation) for country c at time t, existing import tariffs increase the marginal cost and the mark-up is only a function of the product's elasticity of demand in the importer country. For the moment, we assume marginal costs are constant, i.e., the supply curve is perfectly elastic (this will overestimate the effect of the trade policy change). We relax this assumption later.

Total imports for each country are given by

$$m_{ct} = R_t\left(\frac{p_{ct}}{P_t}\right)^{1-\sigma},$$

where the relative price is what matters, i.e., country c's price relative to the aggregate price index for the importing country. Given that Canada is a relatively small trading partner for the countries we consider, we will throughout take total import spending R and the aggregate price index P to be exogenous to Canada's price and quantity choices. In this case it is straightforward to derive that the impact of a trade policy on Canadian exports will be given by

$$\frac{\partial \ln m_{ct}}{\partial t} = (1-\sigma)\frac{\partial \ln p_{ct}}{\partial t}.$$

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[54] Melitz, M. (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71(6), November, pp. 1695-1725.

Given the constant mark-up in the pricing rule, the derivative on the right-hand side is equal to $\Delta t/(1+t)$. The model predicts that the mark-up will not change and that the elimination of the tariff will be passed on to consumers proportionally to the current final good price. At the same time, the quantity sold will increase by ($-\sigma$) times the price decline. Note that the CES model of monopolistic competition assumes that Canadian firms do not take the effect of their pricing decisions on their competitors' behaviour into account. Given the low market share of Canadian firms (between 1% and 3% in the different markets), this seems like a plausible assumption.

In our calculations we take into account that different products face very different demand elasticities, as calculated in the previous section. Hence, the distribution of Canadian exports over the different sub-sectors will be very important. We calculate the effect of three possible free trade agreements (FTAs)—with China, with South Korea, and with the enlarged E.U. (with 25 members)—under which Canadian parts exporters would see their import tariffs eliminated. We do not include an FTA with Japan, as it currently does not impose any import tariffs on automotive parts.

Current Chinese tariff rates are 15%, but they are scheduled to decline to 10.3% under its WTO agreement. South Korean tariffs are, as far as we have been able to determine, currently 8% uniformly across all automotive parts. European tariffs are lower and vary somewhat by category. On small engines and most engine parts, the E.U. levies 2.7%, on larger engines the rate is 4.2%. On most other components it levies 3% duties, but on a whole range of "not elsewhere classified" products, the duty is 4.5%. For China and the E.U. we present two alternative sets of results, using the lower or the upper range for the tariff rates.

For all three countries, we also present alternative calculations using the highest demand elasticity estimate obtained for each good, see Table 4.12, or using the low demand elasticity. We calculate the absolute value of the expected import increase (Canadian exports) by summing over all the 6-digit HS categories. We also express the total amounts as a fraction of the current Canadian export levels. The top panel of Table 4.13

contains the four sets of results if we use the 2005 trade flows as benchmark, the bottom panel uses the average 2004-2005 trade flows as a robustness check to guard against annual fluctuations.

Table 4.13. Counterfactual simulations of Canadian import changes following separate FTAs with three trading partners

demand elasticity	**initial tariff**	**China**		**South Korea**		**E.U. 25**	
2005 Canadian import levels							
min	low	$8.61	10.4%	$1.43	8.4%	$5.90	3.4%
min	high	$12.03	14.6%			$8.83	5.4%
max	low	$13.13	15.9%	$1.98	11.6%	$9.08	5.2%
max	high	$18.34	22.2%			$13.58	7.9%
Average 2004-2005 Canadian import levels							
min	low	$17.89	10.2%	$0.96	8.7%	$5.33	3.7%
min	high	$25.00	14.3%			$8.00	5.5%
max	low	$26.88	15.4%	$1.34	12.2%	$8.05	5.6%
max	high	$37.54	21.5%			$12.07	8.3%

Note: Effects are expressed in million CDN$ or as a percentage of initial parts exports

Before we discuss the results, it is important to stress that this is a counterfactual analysis, not a prediction. We tried to assess what Canadian exports would have been had exports not been subject to import tariffs in 2005. Given the rapid change in the industry, this is quite different from the expected export change if tariffs will be eliminated in the future. Even without any trade policy change the 2006 statistics are likely to look very different from 2005[55].

The predicted changes are rather large. For 2005, they range from 10.4% to 22.2% for a FTA with China, from 8.4% to 11.6% for a FTA with South Korea, and from 3.4% to 7.9% for a FTA with Europe. Given that the average demand elasticity is around two (using the "min" elasticity), we find that quantity exported increases approximately twice as much as price decreases and the net gain in import revenue is roughly equal to the initial tariff rate. When we use higher demand elasticities, the price response does not change, but quantity changes more, leading to larger effects.

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[55] As an example, Canadian parts exports to China nearly halved from 2003 to 2004 as shipments of body panel for the Buick model assembled in Shanghai stopped.

The difference in import response across the different trading partners is predominantly the result of differences in the current tariff rates. However, the composition matters as well. For example, exports to the E.U. are largest in the HS 870829 category, which has one of the lowest demand elasticities. As a result, total exports to the E.U. increase slightly less than the average tariff decline, while we find the reverse for the FTAs with China or Korea (a slightly more than proportional export increase). Similarly, for Europe the predicted import increase of Canadian products is almost twice the average level of tariff reduction in the most optimistic case, reflecting that for some important goods (in particular HS 870870 and 840891) the high demand elasticity is almost double the low elasticity. High elasticities mean low mark-ups and the same price reduction has more impact and, moreover, consumers are more responsive.

Another point worth noting is that the absolute values are sizeable. Even though China's automotive industry is not very large yet, it does import a lot of components. This tends to be typical of low-wage assembly centres. Imports of components outstrip exports and the reverse holds for finished goods. In the automotive industry, China is a large importer of both components and finished vehicles. The large import response we estimate would translate into extra sales for the Canadian industry in China with estimates ranging from $8.79 to $18.34 million CDN, depending on the choice of demand elasticity and initial tariff level. Consistent with the previous discussion, we find smaller effects in the most recent year (using the 2005 import data) than using average imports for the 2004-2005 period. It indicates that the Chinese industry is rapidly increasing its level of self-sufficiency.

Finally, we cannot distinguish between OE parts and aftermarket parts in this part of the analysis. The trade statistics are not broken down along that dimension. We do not know the share of aftermarket parts in total parts exports, but it is likely to exceed the share of aftermarket parts in domestic production. While Canadian firms are very tightly integrated in the North American industry, that is much less the case overseas. Canadian exporters often claim they have a very hard time penetrating overseas OEM markets. Given that Japanese and Korean firms take a long time to increase the domestic content in the vehicles they assembly in North America, this seems plausible. The current analysis assumes all Canadian parts exports are aftermarket, which is obviously an overestimate of the likely effect of the FTAs, but not necessarily a very large overestimate. For the actual effect, we should simply pro-rate the absolute import increases (by the share of aftermarket parts in exports), while the percentage changes are valid.

Another factor that would lower the expected impact of tariff reductions is an upward sloping supply curve. The results in Table 4.14 incorporate the estimated slope of the supply curve in the simulations. The estimated supply elasticities correspond to the inverse of the effect of increased output on marginal costs. Incorporating this effect in the pricing rules gives

$$\frac{\partial \ln p_{ct}}{\partial t} = \underbrace{\frac{\partial \ln c_{ct}}{\partial t}}_{= \frac{\partial \ln c_{ct}}{\partial \ln q_{ct}} \frac{\partial \ln q_{ct}}{\partial t}} + \underbrace{\frac{\partial \ln(1+t)}{\partial t}}_{=1/(1+t)} + \underbrace{\frac{\partial \ln(\sigma/(1-\sigma))}{\partial t}}_{=0} .$$

Table 4.14. Counterfactual FTA simulations with an upward sloping supply curve

demand elasticity	**supply elasticity**	**initial tariff**	**China**		**South Korea**		**E.U. 25**	
2005 Canadian import levels								
mean	mean	low	$2.68	3.25%	$0.31	1.83%	$1.84	1.07%
mean	mean	high	$3.75	4.54%	$0.31	1.83%	$2.76	1.61%
max	max	high	$5.20	6.30%	$0.54	3.14%	$4.36	2.54%

Note: Effects are expressed in million CDN$ or as a percentage of initial parts exports

The first term under the first bracket is (*1/ω*), the inverse of the supply elasticity, the second term can be expressed as a function of the price change by taking the derivative of the relative import demand, which gives $-\sigma\frac{\partial \ln p_{ct}}{\partial t}$. Solving for the optimal price response, we find that the earlier price change $\Delta t/(1+t)$ is adjusted by a factor $(1+\sigma/\omega)^{-1}$. A higher supply elasticity (ω) will lead to a larger price response as marginal costs are almost constant. A higher demand elasticity (σ) will lead to a smaller price decrease for any positive supply elasticity, because it leads to larger cost increases as quantity is very responsive.

When we perform the counterfactual simulations taking supply effects into account, the import effects are much smaller, not surprisingly given the low supply elasticities estimated in the previous section. In the first line of Table 4.14 we use the average demand and supply estimates and the low initial tariff rates. In the next line, we use the high tariff rates instead. In the third line, we calculate the most optimistic FTA effect if supply effects are taken into account. We take the maximum estimate for the demand elasticity (which makes quantity very responsive to price declines), the maximum estimate for the supply elasticity (to minimize the increase in marginal cost), and we take the high initial tariffs. Even under this scenario, the estimated impact is reduced by a factor of more than 3 in each country, relative to the upper range of the predictions in Table 4.13. As before compositional effects are important. Even though the tariff reduction is almost twice as high in Korea compared to Europe, the composition of Canadian exports leads to a comparable percentage effect in both countries/regions.

A final caveat is that these calculations assume that the impact of a free trade agreement is proportional to the decline in tariff rates. There are some indications that non-tariff barriers are important. While this is particularly true for final vehicles, it probably affects parts and accessories as well[56]. Unfortunately, there is no clear way to quantify this.

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[56] Even though the Japanese and Korean market shares in the U.S. and Canada vehicle markets are sizeable by now, they have not been able to

4.5.3 Import competition

Even though the calculations would be straightforward, we refrain from carrying out the same type of analysis as in the previous section to study increased import competition in Canada. We expect it would result in very implausible estimates because the large domestic automotive assembly sector imports a lot of OE parts that already enter duty free. For example, while Canada exported $29.2 million worth of parts to Japan in 2004, imports stood at $1743.2 for a deficit of $1713.9 millions. Obviously the majority of these parts enters the assembly process and do not incur any duties. Given the small size of the aftermarket, discussed earlier, especially relative to the large volume of imports, any estimate of the fraction of imports going to the aftermarket would be subject to a very large margin of error.

With South Korea, the E.U., and China, the Canadian deficit in parts is also very large, running to $266.0, $636.3, and $664.7 million respectively, in 2004. Including trade with the US and Mexico, total parts imports in Canada were $42,859 million in 2004 which was approximately 10 times larger than the entire aftermarket parts sales.

Given that in Table 4.10 the rubber tires and parts & accessories industries—the two sectors containing the bulk of aftermarket parts—were estimated to have the lowest demand elasticities of all automotive industries, import responses are likely to be moderate. The effects on import values abroad we estimated in the previous section are a combination of price declines and quantity increases. In sectors with a lot of product differentiation (low demand elasticity) as the aftermarket parts sector, quantity increases will be low—less harm to the Canadian industry, but these will be accompanied by more moderate price declines—smaller benefits for the Canadian consumers.

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penetrate each other's market. In 2003, only 3774 Japanese passenger cars were sold in Korea and 2573 Korean cars in Japan, which represent a market share of 0.28% and 0.04% respectively.

4.6 Pricing-to-market

In section 4.5, the simulations are carried out assuming all firms behave competitively, i.e. the CES demand system leads to a monopolistically competitive industry, where the slope of the residual supply function is not affected by a firm's actions or any action of its competitors. In particular, we have assumed that Canadian exporters do not take the response of foreign competitors into account when they decide how much to lower their price following a tariff cut. While this is probably a good assumption given the small Canadian market share overseas, we verify here how sensible this assumption is.

Using the methodology developed by Goldberg and Knetter (1999)[57] we estimate the slope of the residual demand Canadian firms face in the markets abroad considered in the previous Section. The idea is to identify the slope of the residual demand exploiting exchange rate variability as an indicator for cost changes. Note that these will differ from the demand elasticities estimated earlier. Residual demand elasticities include supply responses by competitors, which will depend on the type of market equilibrium the industry is in—which is not specified explicitly. The estimating equation is as follows:

$$\ln p_{mt}^{ex} = \lambda_m + \eta_m \ln Q_{mt}^{ex} + \alpha' \ln Z_{mt} + \beta' \ln W_{mt} + \varepsilon_{mt}$$

The residual demand for exporter *ex*, to destination market *m*, at time *t*, expresses the price the exporter charges (in the importing market's currency) as a function of its own quantity, demand shifters for the overseas market (*Z*) and cost shifters for its competitors (*W*).

Given that we only have 11 years of data to estimate the equation, we have to be extremely parsimonious in the specification. The only demand shifter we include is a time trend and as cost shifters we use the exchange rate of the two largest importers, apart from the country under investigation. As instrument for the endogenous quantity level, we use the exporter's exchange rate—a valid cost shifter[58]. The results in Table 4.15 are obtained from separate regressions for each of the three regions and for each of the five exporters. Even though the countries sell in the same import market, they will face a different residual demand, because they face different competitors.

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[57] Goldberg, P. K and M. M. Knetter (1999), "Measuring the intensity of competition in export markets", *Journal of International Economics*, 47, pp. 27-60.

Table 4.15. Elasticities of the residual demand curve for total automotive parts

	South Korea		**China**		**E.U. (25)**	
	market share	residual demand elasticity	market share	residual demand elasticity	market share	residual demand elasticity
Canada	**0.6%**	**0.184** **(0.63)**	**1.1%**	**-0.354** **(2.12)**	**1.8%**	**-0.710** **(2.88)**
Japan	39.3%	-1.052	42.5%	-11.990	53.8%	-1.396
United States	15.9%	-1.464	8.1%	0.078	32.5%	-0.758
Euro-area	34.3%	-2.667	22.7%	-1.354		
China	5.5%	0.188			6.1%	-0.134
South Korea			22.0%	-0.743	3.1%	0.632

Note: Sample includes all imports of engines & engine parts and automotive parts and accessories over the 1995-2005 period. t-statistics in parenthesis

Even though Canada has a very small market share in each of the three markets, we find that it has a surprising amount of market power. The statistics are the inverse of the elasticities, as is customary in this literature. An estimate of -0.71 for Canadian exports to the E.U. corresponds to a residual demand elasticity of only 1.41. In the Chinese market, Canada is still estimated to have a decent amount of market power, with an implied elasticity of 2.83, significantly different from a perfectly elastic residual demand. Only in Korea, we find no market power for Canadian firms. The results are relatively similar once we limit the estimation to only a single sub-sector of automotive parts, but many parameters become unstable.

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[58] One might argue that in this industry pricing is in US dollar and that the methodology will not be adequate. However, if that were really the case, one has to be willing to assume that the 30% appreciation of the Canadian dollar against the US dollar in the last two years has been absorbed by profit margins of Canadian suppliers or offset by productivity growth. Assuming a profit margin in excess of 30% in 2003 or productivity growth of 15% per year seem highly implausible.

While Canada has some market power, the implied residual demand elasticities we find for Japan, the E.U., or the U.S. are notably lower. Only in the Chinese market do Canadian firms have more pricing power than the U.S. In contrast, Chinese firms are never estimated to have any significant market power and the only negative coefficient for South Korea, for its exports to China, is estimated very imprecisely (t-statistic is 1.21)—even though its market share is quite large. These results are intuitive as we would expect the countries with the most developed automotive industries to have the most sophisticated and differentiated goods, and hence the largest market power—which lines up well with the estimates in Table 4.15.

In light of these results and the very low market share for Canada in automotive parts exports to South Korea, China, and the E.U., we think that it is plausible to assume Canadian firms will not act strategically in their response to tariff policy changes, as was assumed in Section 4.4.

5. Future direction of the industry

This section analyzes the future direction of the auto industry, particularly in the North American market, in the next 5-20 years, Canada's potential to move towards high-value production of auto products, and the potential to attract future assembly and production of auto production. What would be needed, including vis-à-vis trade policy, to promote high-value production?

5.1 Future direction

Most of the relevant issues have already been addressed in the preceding Sections. Here I just summarize the most important trends—most important in terms of likely future impact.

5.1.1 Fuel

The great unknown for the industry is what type of fuel cars will drive in the future. Currently, the vast majority of vehicles today use a gasoline internal combustion engine, but that is likely to change in the not so distant future[59]. The corporate average fuel efficiency norms (CAFE) have been tightened repeatedly for cars, and the Bush Administration finally raised the standards for light trucks as well, which currently account for more than 50% of new vehicle sales in the U.S.[60]. More efficient, direct injection gasoline engines have started to appear, but more radical alternatives are also on the horizon.

It is not impossible that diesel engines will become much more popular in North America. In Europe they already account for more than 50% of new vehicle sales. A number of big manufacturers, especially Volkswagen and DaimlerChrysler, are committed to offer a greater selection of diesel engines in their passenger vehicle lineup. The advent of clean (low-sulfur) diesel in the U.S. in 2006-2007 is a pre-requisite for modern diesel engines. The future of diesel is by no means secure. The cost penalty to lower diesel emissions to the same level of gasoline emissions is proving to be much more costly than anticipated. At the same time, many of the fuel-saving technological advances common in today's diesels are often not yet introduced in gasoline engines (variable valve timing, turbo charging, and direct injection). Fiat estimates that a diesel engine would cost 1,000 euro more in production than a comparable gasoline engine, have the same CO2 emissions, and only a 5-10% fuel efficiency advantage. A U.S. government plan to provide tax incentives for diesel could prove decisive, but the details remain to be determined. Currently, no diesel engines are manufactured in Canada.

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[59] The most popular current alternatives are diesel (especially for pickup trucks), LPG (especially for taxis and limos), and hybrids.

[60] Automotive News, March 29, 2006, "Fuel economy is toughened for 2008-2011 trucks".

Furthermore, another advantage of the gasoline engine is that it can burn alternative fuels, such as natural gas or hydrogen, with few modifications. This multi-fuel use has proved to be a boon for the electricity generation industry, where modern generating stations switch between natural gas or oil depending on the price of the month. A diesel engine cannot achieve the same feat, although several European countries, especially Sweden and Germany, are making bio-diesel, made from organic material widely available.

While the engine is the most expensive single part of a vehicle, the alternative powertrains considered would have a much greater impact on the structure of the industry. Foremost, hybrids are likely to keep increasing in popularity. Total hybrid sales in 2005 exceeded expectation at 205,749 in the U.S. alone—52% of this by the Toyota Prius, representing 1.2% of all new vehicle sales. This ranges from a share of hybrids in total sales of approximately 8% for Toyota, 4% for Honda, less than 1% for Ford, and negligible for all other manufacturers[61]. A survey of North American automotive executives by KPMG yielded a unanimous prediction that hybrids will increase market share in the coming years[62]. Currently, no hybrids are manufactured in Canada. This will change once Ford introduces the hybrid versions of the Ford Edge and Lincoln MKX in its Oakville assembly plant. The gasoline versions will start production in 2006 as a 2007 model, but production of hybrids is expected to start only in 2010.

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[61] GM has delivered 430 diesel-hybrid busses in the U.S. and Canada and expects to add 237 to that total in the remainder of 2006.

[62] On the sample of worldwide automotive executives, 88% anticipated a rising market share for hybrids.

Plug-in hybrids could also become more popular in the future. These are hybrid cars with an enlarged battery pack that can be recharged from the electricity grid, not only by the onboard gasoline engine. For the vast majority of trips, only the electric engine would be used and the battery pack recharged overnight or at the office. Only on longer trips would the combustion engine be used. This setup does away with a major disadvantage of the previous generation of electric cars: the risk of getting stranded if the battery runs out.

Much further down the line is the changeover to the hydrogen economy and vehicles driven by fuel cells. Current expectations of most automakers are that by 2010 most of the technical aspects will be solved on the experimental models that are now touring the globe. It is also expected to take until 2020 or so before mass manufacturing would make affordable cars possible. An average sized car currently can store about 3 kilograms of pressurized hydrogen gas which can go about 200 to 280 kilometres under normal conditions before refuelling. Developing reliable storage for hydrogen and rolling out a distribution system are considered the biggest challenges for this new technology. As discussed in Section 1.5, Canada is very active in the development of fuel cells.

5.1.2 Assembly location

The second great unknown for the industry is whether final vehicle assembly will stay as close to customers as it has thus far. In the first decades after World War II, the industry produced very large production runs of a small number of vehicles in branch assembly plants close to population centres. For example, U.S. sales of the different guises of the main Chevrolet model totalled almost 1,500,000 units in 1966 and these were assembled in six different assembly plants across the country.

Declining model runs have resulted in very few cars or light trucks being produced in more than one U.S. plant. Except for a few instances where models are moved between assembly plants, not a single car was produced in more than one U.S. assembly plant in 2004[63]. The larger average production run for light trucks makes it more common for them to be assembled in more than one location, but the recent proliferation of crossover vehicles is lowering production volumes of light trucks as well.

Firms could have decided to develop vehicles for the global market, produce them in a single country, and ship them around the world, as is the current practice in the consumer electronics industry. With a few exceptions, this has not happened. Instead firms are investing in flexible manufacturing systems in order to build multiple vehicles on each assembly line[64]. This allows firms to produce a wide range of vehicles on each continent. It is unlikely that this decision is to a large extent driven by trade policy. Most developed countries charge only modest import duties on vehicles. Shipping costs for a bulky and easily damaged (scratched) product like an automobile are likely to be non-negligible and not decreasing over time. Proximity to consumers in a mature industry, where responding quickly to changing tastes is important, is probably another important factor.

The industry has also repeatedly flirted with made-to-order systems. The current industry benchmark for new vehicle inventories in the U.S. is 60 days, which is worth at least $60 billion (US). That is a lot of working capital sitting idle. In practice, inventory is larger for most vehicles; surprisingly, inventories tend to be higher for domestically produced vehicles. In a market where the number of available varieties totals almost 300, the risk of mismatching production and sales is enormous. The potential cost, in terms of a forced discount, to be able to sell undesirable vehicles, is correspondingly enormous. Made-to-order, which is popular in Europe, would tie the assembly location to North America.

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[63] A number of the largest volume vehicles, such as the Toyota Corolla, Chevrolet Malibu, or Ford Focus, are still produced in more than one North American plant.

[64] See Van Biesebroeck (2006), "Complementarities in Automobile Production", NBER Working Paper for a discussion.

Even though a lot of components are currently outsourced to low cost countries, this has not happened with finished vehicles. Two Chinese firms are planning to start exporting finished vehicles from China to North America (Gheely in 2007 and Chery in 2008) and Honda is exporting its Fit subcompact car from Guangzhou to Europe. While the labour cost in assembly is too small a fraction of the total cost of a cart to justify producing it in a low-wage country like China, the trade-off changes once firms would be able to leverage the lower wages over the entire supply chain and produce most components at the low Chinese wage as well. The rapid development of the Chinese domestic industry is quickly making this a possibility. For example, the engines installed in the Chevrolet Equinox in the CAMI plant are shipped from China.

It took Japanese producers only 10 years after their first sales success in North America to establish local assembly capacity, although this choice was accelerated by the voluntary export restraints. Hyundai did not even wait this long to (entirely voluntarily) open up its first assembly plant in Alabama; its second plant, for its Kia subsidiary, has been announced at a time when it is not even certain it will be able to operate the plant at full capacity[65]. An important distinction is that the much larger labour pool in China is likely to keep wages depressed for a longer time than in Japan or Korea. It might make China an attractive assembly location for exports to North America in the future. The major Chinese car and component producers are currently benefiting a lot from their collaboration with leading western automotive companies. They are unlikely to anger their joint venture partners by challenging them in their home market. However, once they feel they have learned what they wanted to know, their incentives will change.

A final issue that has come up repeatedly in this report is the future division of labour between OEMs and suppliers. Many tier 1 suppliers are playing an increasing role in R&D and design. Several firms, e.g., Magna International, are also taking on assembly tasks. Whether this makes it less or more likely that assembly will move overseas remains to be seen.

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[65] An earlier venture in Quebec in 1989 was of a much lower scale.

5.1.3 Volume

As discussed at length in section 1.4, we anticipate a reduction in future North American sales (and production), especially in the U.S. Registrations are at an all-time high and especially very new vehicles abound after a sustained string of bumper sales years. Many industry observers rationalized the large Big 3 sales decline in the fall of 2005 as a mismatch between the gas-guzzling vehicles they produce and consumers' newly acquired taste for fuel-efficiency in the post-hurricane Katrina spike in fuel prices. It seems much more likely that the spectacular summer sales, fuelled by employee discount programs, were responsible. Over the summer, large SUVs had been the most successful market segment and the market is probably saturated[66].

The increased durability of modern vehicles will make sure the current stock of vehicles will be around for quite some time. The large number of fuel-inefficient SUVs and other types of trucks sold in recent years make the fleet of second-hand vehicles less suitable for exporting to less developed economies, especially with the current high fuel price. Exporting new vehicles to keep assembly plants operating at full capacity seems also a very unlikely proposition, as discussed in section 3.5.

The large reorganizations, announced by GM on November 21, 2005 and by Ford on February 19, 2006, seem to suggest that these companies want to aggressively align their North American production capacity with their current production. Further erosion of their market share can then be used to build up some spare capacity to respond to sales opportunities. At the same time, through investments in flexibility OEMs will try to operate their existing capacity much more intensively than before.

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[66] The incentive to switch your purchase decision between time periods to chase after a temporary discount is clearly larger for more expensive vehicles.

5.2 High-value production in Canada

The automobile industry is surprisingly high tech. The five biggest companies (GM, Toyota, Ford, DaimlerChrysler and Volkswagen) combined spent a total of $33.7 billion USD on R&D in 2004! There is not a single other industry with five firms spending an average of almost $7b on R&D. One can count the number of industries with *any* firm spending that much on one hand. R&D spending by suppliers is also increasing rapidly. By 2005, the automotive firm holding most U.S. patents was Robert Bosch GmbH, now the largest OEM supplier worldwide. The Ford Motor Company was runner-up. A search of the NBER patent database reveals that these two companies combined hold more than 11,000 patents and indirectly through subsidiaries countless more.

R&D is not only concentrated by firm, it is also predominantly carried out in Michigan. Its importance is not only apparent from the location of headquarters (more than 50% of the 150 largest North American suppliers are located there), but also in terms of recorded R&D spending. The Michigan Automotive R&D directory estimates that in 1999 total R&D spending in Michigan totalled US$18b, almost all of which was privately funded, and involved 65,000 employees. Only California performs more R&D, but on a per-capita basis Michigan is unrivalled in the United States[67]. 70% of the research, US$13.1b, was on automotive applications and Michigan alone represents 85% of total U.S. R&D spending in the industry.

It is not immediately obvious how Canada will attract a piece of the research pie. The vast majority of Canadian suppliers is in favor of government support for R&D activities; see below. Recent capital investment subsidies under the (federal) Canadian Skills & Innovation Project and the Ontario Automotive Investment Strategy have tied funding to locating some innovative activities in Canada. Ford is adding a research centre to its Oakville assembly plant. GM's Beacon project features heavy investments in human capital. Canada's largest automotive firm, Magna International operates a total of 60 R&D centres and test facilities, but only 8 in Canada. While regrettable for Canada, it is hard to imagine it being otherwise as only a quarter of its production facilities is located in Canada. In terms of policy, all the government can do is to create an environment conducive to R&D such that firms that reorganize have an incentive to locate research activities in Canada. Given the generous tax treatment of R&D in Canada, current policy seems adequate[68]. It is certainly not obvious how trade policy can play a role.

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[67] At $180,000 per capita of R&D, Michigan is only rivaled by Massachusetts (#3 at $151,000) and tiny states with many headquarters like Delaware (#2) or Rhode Island (#4).

In terms of high value-added production activities, Canada is keeping up better with the U.S. in the assembly sector than in parts. Table 5.1 compares the productivity record of the two countries in both automotive sectors. In the top panel, one can see that shipments per employee are equally large in both countries, in excess of $1 million CDN. The fraction of value added is similar as well and slightly higher in 2002 than in 2000. Value added per employee was higher in Canada in 2000 and only slightly lower in 2002. The fraction of production workers is a bit lower in the U.S., which increases the 2002 U.S. labour productivity advantage slightly, but at $433,574 (U.S.) versus $405,963 (Canada) the values are extremely high. The significantly higher salary for U.S. production workers, 42% higher in 2002 (31% in 2001), is almost entirely the result of a much larger share of value added being paid out to workers in the U.S. than in Canada. The U.S. industry employs more and better paid salaried employees, but that explains only a small fraction of the gap in value added going to wages, 16.0% in Canada versus 24.5% in the U.S. The much vaunted lower wage cost in Canada, courtesy of the nationally funded health care system, seems to benefit predominantly the employer.

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[68] See Van Biesebroeck (2006), "Impediments and Facilitators to Technology Adoption. A literature survey", report prepared for Industry Canada.

Table 5.1 Productivity comparison: Canada versus the U.S.

	Canada			US		
	2000	2002		2000	2002	
Assembly (NAICS 3361-3362)						
Shipments per employee	**$1,147,471**	**$1,141,529**	**-0.5%**	**$1,079,286**	**$1,191,334**	**10.4%**
VA as % of shipments	28.8%	30.9%		26.8%	30.7%	
Value added per employee	**$330,728**	**$352,655**	**6.6%**	**$289,188**	**$365,156**	**26.3%**
Prod workers as % of total employment	84.3%	86.9%		85.0%	84.2%	
Value added per production worker	**$392,246**	**$405,963**	**3.5%**	**$340,391**	**$433,574**	**27.4%**
Production wages as % of value added	14.1%	14.0%		21.3%	18.6%	
Production wages per production worker	**$55,445**	**$56,658**	**2.2%**	**$72,490**	**$80,562**	**11.1%**
Payroll as % of value added	17.2%	16.9%		26.3%	22.6%	
Average salary of white collar workers	**$65,111**	**$79,303**	**21.8%**	**$95,346**	**$92,536**	**-2.9%**
Parts (NAICS 3363)						
Shipments per employee	**$330,460**	**$334,145**	**1.1%**	**$378,133**	**$433,291**	**14.6%**
VA as % of shipments	40.1%	36.9%		41.3%	42.4%	
Value added per employee	**$132,521**	**$123,186**	**-7.0%**	**$156,337**	**$183,686**	**17.5%**
Prod workers as % of total employment	87.2%	85.3%		80.1%	79.5%	
Value added per production worker	**$152,001**	**$144,496**	**-4.9%**	**$195,192**	**$230,983**	**18.3%**
Production wages as % of value added	29.6%	32.7%		31.1%	27.3%	
Production wages per production worker	**$44,959**	**$47,261**	**5.1%**	**$60,699**	**$63,071**	**3.9%**
Payroll as % of value added	36.1%	40.7%		41.8%	37.2%	
Average salary of white collar workers	**$67,706**	**$66,829**	**-1.3%**	**$84,088**	**$89,204**	**6.1%**

Note: all figures in CDN dollar

Source: Own calculations based on DesRosiers Automotive Yearbook (2005) and data from Statistics Canada and U.S. Census Bureau

The situation is notably different in the parts sector. The salary gap between U.S. and Canadian production workers is similar 33.5% higher in the U.S. in 2002 (35% in 2001), but here it is mainly driven by much less value added generated in Canadian firms. The share of value added paid out in wages and benefits is comparable across the two countries. The fact that Canadian firms have much fewer salaried employees makes the difference in labour productivity—measured as value added per production worker—particularly stark; it was 60% higher in the U.S. in 2002.

A couple of caveats are required to put this comparison in perspective. First, a larger fraction of the parts sector output stays in Canada and the very low Canadian—U.S. dollar exchange rate in 2002 undervalues Canadian output in that year. Second, the mix within the parts sector is disadvantageous for Canada. A greater fraction of U.S. employment is in engine production which is highly capital intensive, which biases U.S. value added upward[69]. In addition, the Canadian engine sector was operating in 2002 at approximately 50% of its usual value added per worker. Third, the Canadian industry is reallocating its parts employment towards a number of sub-sectors with higher than average value added per worker: engine & engine parts and interiors, while maintaining a large employment share in a third high value added sector—transmissions (see statistics in Table 4.5).

Finally, in Table 5.2 we present a breakdown of total value added generated in the U.S. automotive industry in different years, as estimated and predicted by the Center for Automotive Research in Michigan[70]. The most important sub-sector throughout was parts and components. Increased cost pressure, due to import competition and purchasing plans of OEMs, depressed its share slightly in 2000 to 56.0%. Increased use of electronics is predicted to raise its share to 60.1% of total value added generated in the industry by 2010. The share of value added generated by OEMs (including assembly) is predicted to decline considerably from its 2000 high to 26.4%, slightly more than one quarter of the industry. For these firms, assembly wages are predicted to decline from 35% of their value added in 1990 to 23% in 2010. Clearly, high value added activities in the automotive sector increasingly means parts and R&D.

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[69] Given that the two countries use a different breakdown of the NAICS industry classification below the "Parts and accessories manufacturing" (NAICS 3363) level, it is impossible to control for the mix of industries to make the value added comparison.

[70] Center for Automotive Research (2002), "Estimating the New Automotive Value Chain," a study prepared for Accenture.

Table 5.2 Breakdown of the total value added generated by automotive sub-sector

(billion USD)	1990	2000	2010
Total automotive sector (U.S.)	**$291.0**	**$432.0**	**639.5**
Distribution (Advertising – dealers – freight)	$36.0 (12.4%)	$43.0 (10.0%)	$64.6 (10.1%)
Vehicle manufacturers – wages	$25.2 (8.7%)	$31.2 (7.2%)	$39.1 (6.1%)
Vehicle manufacturers – other value added (design, R&D, investment)	$46.2 (15.9%)	$97.2 (22.5%)	$129.9 (20.3%)
Parts & components	$169.7 (58.3%)	$241.9 (56.0%)	$384.2 (60.1%)
Other material inputs (energy, warranty,…)	$13.9 (8.2%)	$18.7 (4.3%)	$29.5 (4.6%)

5.3 Policy

To gauge the importance of different policy options for the industry, it is useful to take a look at the answers Canadian parts suppliers gave to the previously mentioned APMA survey. On a scale from 1 to 7 firms were asked to rate the usefulness of different policy initiatives on a list of 20. The results of this survey are in Table 5.3. The first column indicates the number of suppliers that find the initiative useful (more than moderately so); the second column is the fraction of respondents that find the policy initiative "very useful" or rate its usefulness "extremely high"; and the third column sums the two groups. The different initiatives are organized in order of total support—any answer from 5 to 7.

Table 5.3 How useful to you find the following policy initiatives?

"Industry observers have suggested policies that the government could take to facilitate or enhance the growth of the Canadian auto industry. Several of those proposals are listed below. From the perspective of your firm, please rate the usefulness of these government policy proposals from 1 to 7 based on the following scale:"

		Fraction of positive ratings		
	POLICY INITIATIVES:	**5**	**6-7**	**5-7**
1.	Increase funding and/or tax incentives for R&D and innovation	7.1	78.6	85.7
2.	Increase incentives to domestic investors	14.3	71.4	85.7
3.	Expedite transportation infrastructure upgrades	7.1	71.4	78.5
4.	Increase incentives to foreign investors	21.4	57.1	78.6
5.	Increase funding for Technology Partnerships type programs	28.6	42.9	71.4
6.	Implement electronic border clearing system compatible with US Customs	14.3	50.0	64.3
7.	Remove tax and other barriers that slow domestic industry consolidation	14.3	50.0	64.3
8.	Change tax law to permit more rapid depreciation of new equipment	16.7	41.7	58.3
9.	Assistance for implementing productivity-enhancing equipment/systems	33.3	25.0	58.3
10.	Renew emphasis on government-industry partnerships and task forces	21.4	35.7	57.1
11.	Increase funding for auto-sector related technical education	21.4	35.7	57.1
12.	Provision of capital to facilitate new international joint ventures	14.3	42.5	56.8
13.	Increase incentives to firms using alternative energy	21.4	21.4	42.9
14.	Government-led marketing/branding initiatives focusing on the auto sector	28.6	14.3	42.9
15.	Make the use of anti-dumping/countervail legislation easier	16.7	25.0	41.7
16.	Facilitation of Canadian auto sector in rapidly growing markets	8.3	25.0	33.3
17.	Increase tax credits for firms that implement retraining/'reskilling' programs	0.0	21.4	21.4
18.	Reduce immigration restrictions on young, technologically skilled workers	0.0	21.4	21.4
19.	Rescind Canadian ratification of the Kyoto Protocol	0.0	15.4	15.4

Notes: scale of usefulness: 1 = extremely low, 4 = moderate, 7 = extremely high

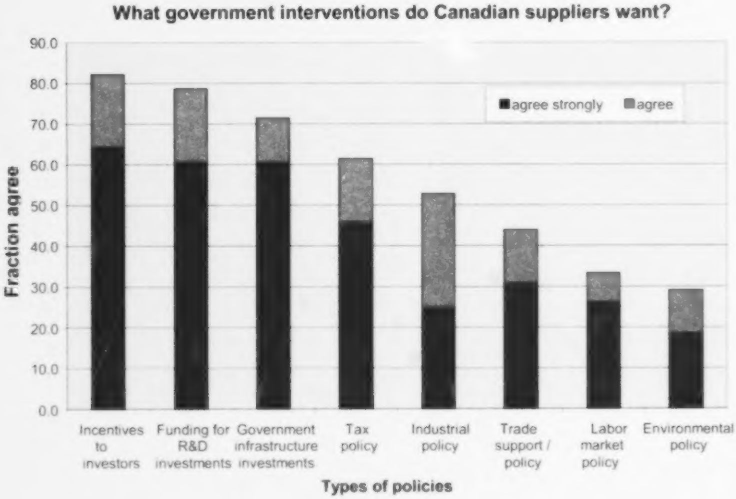
84 respondents

Source: "The East Asian Automobile Industry: Opportunity or Threat? Results of a Survey of the Canadian Auto Parts Manufacturers," Canada in Asia report, January 2005

It is clearly noticeable that R&D support and investment incentives figure high on the list. These issues get almost universal approval—86% of firms support such initiatives and almost 80% of firms strongly support R&D support. On the other hand, a number of issues that have received prominent attention in the media, do not carry much industry support. For example, Canada's ratification of the Kyoto emission abatement agreement is not perceived as much of a problem. Providing support for technical education carries some support, 57% of firms, but reducing immigration restrictions on young skilled workers is not seen as a solution to the industry's shortage of skilled trades people.

In Figure 5-1, we group the average support of different initiatives by policy area. For example, investment incentives for domestic firms and FDI are grouped together. Support for R&D and funding for Technology Partnership type programs are grouped under innovation policies. The pattern that appears is quite striking. Given that only a single policy would be assigned a different priority when we use strong support instead of total support, we will use total support numbers in the discussion[71].

Figure 5-1 Ranking of interventions by policy area



Investment support of different sorts is by far the preferred form of government intervention. More than 80% of firms think it would be a good idea for Canada to provide direct investment incentives; the level of support is only slightly higher for incentives for domestic than for foreign firms. In addition, assistance for firms that innovate is also widely supported. This can take the form of direct funding support, tax incentives, or funding for Partnership Programs. Finally, government investment in infrastructure, electronic border clearing with the U.S. or transportation infrastructure, is also supported by 71.4% of firms.

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[71] While 52.8% of firms support some form of industrial policy, only 25.0% finds these very useful. Limit attention to firms that strongly support a policy, industrial policy would become second least importance.

The next policy area receives a full 10% less support and even 15% less if we only count strong supporters. Even more striking is that the next priority is tax policy. An area of government policy that is likely to differ only in implementation from the more pro-active forms of investment support in the first three areas. The remaining policy areas, industrial, trade, labor market, or environmental policy all carry much lower levels of support. The only popular trade policy (Provision of capital to facilitate new international joint ventures) is again a form of investment support. Restricting import competition by facilitating the use of antidumping measures as well as more active government support to facilitate Canadian exports in rapidly developing markets do not gather much enthusiasm.

The overall picture that emerges is that the only interventions that carry widespread support are government investments or support for private investments. With respect to trade policy, these sentiments from the industry are reinforced by much of the analysis in the preceding chapters. Current tariff levels are sufficiently low that they are not viewed as very important policy tools. In the analysis, consumer gains from lowering tariff levels counteract producer losses with minimal net effect on Canada as a whole. In addition, the dominance of the U.S. as trading partner for the industry further reduces any effect of trade policy.

5.4 Conclusion

The sentiment towards government policy in this industry is not entirely at odds with the bulk of the results we have uncovered in this report. To summarize:

- One of the greatest changes in the industry, the changing vertical organization, is almost entirely beyond government influence. Increasing technological intensity is driven by consumer demand. Proliferation of vehicles has lead firms to adopt flexible technology and environmental awareness has spurred the development of alternative fuel vehicles. While firms clearly benefit if the government covers part of their R&D costs, the greatest success story to date, the Toyota Prius, hardly benefited from government subsidies. It remains highly doubtful to what extent government intervention can successfully steer the industry. (Section 1)
- Decreasing or abolishing import tariffs on final vehicles will benefit consumers (somewhat) and hurt Canadian production (somewhat). The net effect on welfare is likely to be very small and actual estimates, like the ones we presented in this report, will be sensitive to modeling assumptions. (Section 2)
- The only candidate firm for near term investments in new assembly capacity in Canada is Nissan. Trade policy is likely to be of limited impact in securing such investment. Infrastructure or direct investment support are likely to be much more important. The Ontario government has already started talks. (Section 3)
- The parts sector is much more vulnerable to exchange rate fluctuations, raw material prices, and bankruptcies of large firms, factors largely beyond the Canadian government's control. The very limited export success of the Canadian industry beyond the U.S. is unlikely to be to a large extent the result of trade restrictions[72]. Of course, at the margin every-

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[72] Japan, the largest market after the U.S. and distinctly high-cost, does not charge any import tariffs, but Canadian producers have not made significant inroads.

thing helps. Current trade protection for the parts sector in Canada is very low. If giving up the limited protection that exists would lower overseas trade barriers (which tend to be higher), the net effect is likely to be positive. (Section 4)

- When asked about preferred government interventions, a large majority of firms in this industry refer to investment, R&D, and infrastructure support. (Section 5)